REMARKS

The Office Action dated December 18, 2002 has been reviewed in detail and the application has been amended in the sincere effort to place the same in condition for allowance. Reconsideration of the application and allowance in its amended form are requested based on the following remarks.

Applicants retain the right to pursue broader claims under 35 U.S.C. §120.

Applicants have provided a unique solution with respect to A FLAT PANEL LIQUID-CRYSTAL DISPLAY SUCH AS FOR A LAPTOP.

Applicants' solution is now claimed in a manner that satisfies the requirements of 35 U.S.C. §103.

Claims 61-80 are newly presented herewith. Care has been taken to avoid the introduction of new matter. All of the changes made in this Amendment are without prejudice, so that the matter deleted maybe reintroduced as necessary for prosecution of the application.

There are now two independent claims in the application, Claim 61 and Claim 64. Please note that independent Claim 61 has two dependent claims, Claims 62 and 63. Independent Claim 64 ostensibly corresponds to now-canceled Claim 47. Independent Claim 64 has sixteen dependent claims, specifically, Claims 65-80.

Please note that for all of the arguments presented herein, the symbol "%" when used in reference to the composition of glass refers to the amount of a particular component in percent by weight based on oxide.

Rejection of Claims 44-56 under 35 U.S.C. §103:

Claims 44-56 were rejected under 35 U.S.C. §103 in view of any one of Narita et al. (Narita hereinafter), Peuchert et al. (Peuchert

hereinafter), Watzke, Lautenschläger et al. (Lautenschläger hereinafter), and Nishizawa et al. (Nishizawa hereinafter). Please note that Claims 44-56 have been canceled herein, without prejudice.

As stated above, Claims 61-80 are newly presented herein. Claims 61-80 will be discussed herein with respect to Narita, Peuchert, Watzke, Lautenschläger, and Nishizawa.. Claims 61 and 64 are independent claims and therefore will be primarily discussed with reference to each of the applied prior art references. Please note that Claim 64 ostensibly corresponds to canceled Claim 47.

1. Discussion of Claim 61 in View of Narita:

With reference to the Abstract, the Examiner stated in the outstanding Office Action that Narita discloses:

"an alkali-free glass consisting of
40-70 wt% SiO_2,
5-20 wt% B_2O_3,
6-25 wt%Al_2O_3,
0-10 wt% MgO,
0-15 wt% CaO,
0-10 wt% SrO,
0-30 wt% BaO,
0-10 wt% ZnO,
0.05-2 wt% SnO_2, and
0.005-2 wt% Cl_2." (emphasis added)

It is submitted that Narita discloses very large ranges for eight of the components of the borosilicate glass.

Narita generally discusses extremely broad ranges of components that either encompass or overlap the ranges in Claim 61. In the abstract of Narita, the broad ranges are set forth as follows:

> An alkali-free glass essentially consists of, by weight percent, 40-70% SiO_2, 6-25% Al_2O_3, 5-20% B_2O_3, 0-10% MgO, 0-15% CaO, 0-30% BaO, 0-10% SrO, 0-10% ZnO, 0.05-2% SnO_2, and 0.005-1% Cl_2, and substantially contains no alkali metal oxide.

It is respectfully submitted that these broad ranges do not

provide "sufficient specificity" as required by MPEP 2131.03. MPEP 2131.03 states, in part:

> When the prior art discloses a range which touches, overlaps or is within the claimed range, but no specific examples falling within the claimed range are disclosed, a case by case determination must be made as to anticipation. In order to anticipate the claims, the claimed subject matter must be disclosed in the reference with "sufficient specificity to constitute an anticipation under the statute." What constitutes a "sufficient specificity" is fact dependent. **If the claims are directed to a narrow range, the reference teaches a broad range, and there is evidence of unexpected results within the claimed narrow range, depending on the other facts of the case, it may be reasonable to conclude that the narrow range is not disclosed with "sufficient specificity" to constitute an anticipation of the claims.** The unexpected results may also render the claims unobvious. The question of "sufficient specificity" is similar to that of "clearly envisaging" a species from a generic teaching. (emphasis added)

With reference to the above bolded portion of MPEP 2131.03, please note that, in the present application, independent Claim 61 sets forth relatively narrow ranges in comparison to the broad ranges disclosed in Narita.

In addition, the claimed ranges of the present invention have been found to produce "unexpected results." In the present invention as claimed in Claim 61, for example, the composition produces a glass having a very high glass transition temperature, T_g, greater than 713°C. As is known in the art, when the transition temperature is increased, a person of skill in the art would expect a corresponding and substantial increase in the temperature at which workability is reached and the temperature at which melting is achieved. However, the claimed composition produced a glass where the working points and melting points did not increase as a person of skill in the art would expect. This concept is discussed in much greater depth

below.

Therefore, since the "claims are directed to a narrow range, the reference teaches a broad range and there is evidence of unexpected results within the claimed narrow range...it may be reasonable to conclude that the narrow range is not disclosed with 'sufficient specificity' to constitute an anticipation of the claims," as stated in MPEP 2131.03.

1a. Discussion of Probabilities of Selecting Ranges of Claim 61 from Broad Ranges of Narita:

It is also believed that Narita is insufficiently specific because of the size of the broad ranges disclosed in comparison to the relatively narrow ranges recited in the independent claims of the present invention. These broad ranges are not believed to permit a person of ordinary skill in the art to "clearly envisage" the claimed invention. In this regard, Applicants wish to discuss herein below what is understood by the Applicants to be the probability of a chance selection of all of the preferred ranges as claimed in Claim 61 using the broad ranges disclosed in Narita as a basis.

1a. (A) General Hypothetical Example of Probabilities:

However, before Narita is discussed in detail, Applicants wish to present a hypothetical example to evidence the method employed to calculate the probability of selection of the preferred ranges. In this very simple, hypothetical example, there are two components, labeled X and Y. A person is made aware of the desirability of combining Components X and Y, which components can be combined using different quantities of each component. Unfortunately, the person is not aware of what particular quantity of Component X is desirable to combine with a particular quantity of Component Y. However, the person is made aware that the preferred quantity of Component X is

one of two possible quantities, specifically, Quantities A and B, and that the preferred quantity of Component Y is one of four possible quantities, specifically, Quantities C, D, E, and F. The person must then choose only one of the quantities of Component X to combine with only one of the quantities of Component Y in the hope of achieving the desired combination, which in this example is Combination BD (the combination of Quantities B and D). Box A shows the components, quantities, and all possible combinations thereof.

BOX A

	A		B	
Component X	50%		50%	
	C	D	E	F
Component Y	25%	25%	25%	25%
All Possible Combinations	AC, AD, AE, AF, BC, BD, BE, BF			

In order to find the preferred Combination BD, in this example it is assumed that the person must choose first from the available quantities of Component X, that is, between Quantities A and B. Once the person chooses either A or B, he then must choose from the available quantities of Component Y, that is, between Quantities C, D, E, and F, to create a combination. However, as shown in Box A, there are eight possible combinations (AC, AD, AE, AF, BC, BD, BE, BF) of Components X and Y, only one of which combinations, Combination BD, is correct. Therefore, the person has a one in eight chance of picking the preferred quantities to create the preferred combination.

Please note that the chances of selecting **only** the preferred

quantity of Component X in the above example are very good. Since there are only two possible quantities to choose from, the person has a one in two, or 50%, chance of selecting the preferred Quantity B. Further, the chances of selecting **only** the preferred quantity of Component Y, though less than Component X, are also fairly good. Since there are only four possible quantities to choose from, the person has a one in four, or 25%, chance of selecting the preferred Quantity D. However, the chances of selecting **both** of the preferred quantities, and thus the preferred Combination BD, **at the same time** is one in eight, or 12.5%. It is therefore evident that increasing the number of components to be used in a combination, as well as increasing the number of possible quantities of the components, substantially **decreases** the chances that a specific combination could be selected by chance from such numerous possibilities.

1a. (B) Specific Example of Probabilities Using Claim 61 and Narita:

This conclusion is evidenced dramatically when examining the teaching of Narita with respect to Claim 61 of the present application, in which example the odds of selecting all of the preferred ranges of Claim 61 from the ranges disclosed in Narita is extremely low. For example, in Narita the content of BaO is within the range of 0 to 30%. In Claim 61, the content of BaO is within the range of zero to less than 0.5%, which means that the BaO content is in a range that is approximately 0.5%. For a person using Narita as a basis for producing a glass having a BaO content in the range of from zero to 0.5% as claimed in Claim 61, he would have to pick a range that encompasses 0.5%. Starting at zero and using 0.5% increments (0-0.5%, 0.5-1%...29-29.5%, 29.5%-30), there are **60** possible 0.5% ranges in the overall range of 0-30% of Narita. In this particular

example, the person therefore has a **one in 60**, or an approximately **1.67%**, chance of selecting the preferred range.

Please note, however, that there is a tremendous number of possible ranges of 0.5% in a 0-30% range. Therefore, the chance or probability that the person, using the 0-30% BaO range in Narita as a basis, would pick the zero to 0.5% BaO range as claimed in Claim 61 would be even lower than that stated above. To further explain by way of another hypothetical example, similar to the one above, it could be assumed that Narita shows approximately **296** 0.5% ranges, starting with zero and increasing the beginning of each range in 0.1% increments, for example, as follows: 0-0.5%, 0.1-0.6%, 0.2-0.7%...29.3-29.8%, 29.4-29.9%, and 29.5-30%. Out of these 296 possibilities, it could be assumed that only one is the preferred range for BaO. Therefore, in this example, the person using Narita as a basis would have approximately a **one in 296**, or **0.33%**, chance of selecting the preferred range. As stated above, this is a conservative example, and it is presented for purposes of argument. The actual chances of selecting the preferred range could be substantially lower since there are a great number of possible 0.5% ranges that could be found in a 0-30% range. It is therefore respectfully submitted that Narita is not sufficiently specific in its disclosed ranges to teach or suggest the invention as claimed in Claim 61 based **solely** on the slight chance of picking the correct range of BaO.

Assuming for the sake of argument that a person were to essentially "beat the odds" lect the preferred 0.5% range for BaO, he still would have to ove, ome the odds of picking each and every preferred range for all of the other components. Further, with the addition of each component into the selection process, the odds of selecting **som or all** of the components in their preferred ranges,

even in the conservative example presented herein, are extremely low. For example, SrO in Narita is found within a range of 0-10%, whereas the SrO range in Claim 61 is 2.6% to less than 4%. Using the same method used above for BaO, it could be assumed that Narita shows approximately seven 1.4% ranges, starting with zero and increasing in 1.4% increments, for example, as follows: 0-1.4%, 1.4-2.8%, 2.8-4.2%, 4.2-6%, 6-7.4%, 7.4-8.8%, and 8.6-10%. Out of these seven possibilities, it could be assumed that only one is the preferred range for SrO. Therefore, in this example, the person using Narita as a basis would have approximately a one in seven, or 14.3%, chance of selecting the preferred range of SrO.

Assuming, hypothetically, that the person must choose one of sixty possible ranges for BaO, and then has to select one of seven possible ranges for SrO, the odds of picking **both** preferred ranges **at the same time** increases substantially. To further explain, for every one of the sixty possible ranges for BaO, there are seven possible ranges of SrO that could be combined with it. Therefore, there are **420** possible combinations (60 BaO times 7 SrO) of the possible ranges of BaO and SrO. Since only **one** of the **420** possible combinations is the preferred combination of ranges, the person has a very slight, **one in 420**, or approximately **0.23%**, chance of selecting the right combination of ranges.

As one can imagine, with each additional component, the chances of choosing **all** of the preferred ranges increases exponentially. Based on the above method of calculation, even in the very conservative example presented herein below, the odds of choosing **all** of the preferred ranges as set forth in Claim 61, using Narita as a guide, are approximately **one in 7,407,407** (see Table 1). It is respectfully submitted that such odds would be extremely difficult,

if not impossible, to overcome.

1a. (C) Additional Example of Probabiliti s Using Claim 61 and Narita and Including Intermediate Rang s:

Again, it should be emphasized that the above examples are very conservative. In the above examples, **no intermediate ranges were considered**. Narita could be considered to show an even greater number of possible ranges if intermediate ranges are included and depending on how one determines what the possible ranges are. For example and as stated above, for a person using the Narita reference as a basis for producing a glass having an MgO content in the range of from 4 wt% to 8 wt% as claimed in Claim 61, he would have to pick a range that encompasses about 4.0%, such as 1-5.0% or 5-9.0%, from the overall range of 0-10% of MgO in Narita. Including intermediate ranges and by counting in 1% increments starting at zero, there are 7 possible ranges of 4.0% in a 0-10% range (0-4.0, 1-5.0, 2-6.0, 3-7.0, 4-8.0, 5-9.0, and 6-10). Therefore, the person using Narita, in this particular example, would have an approximate 1 in 7 chance, or an approximately 14% chance, of picking the range for MgO disclosed in Claim 61. Including intermediate ranges and by counting in 0.5% increments starting at zero, there are 14 possible ranges of 4.5% in a 0-10% range (0-4.0, 0.5-4.5, 1-5.0 ... 5.5-9.5, and 6-10.0). Therefore, the person using Narita, in this particular example, would have an approximate 1 in 14 chance, or an approximately 7% chance, of picking the range for MgO disclosed in Claim 61.

In view of the above, it is respectfully submitted that the preferred ranges of all of the components of the present invention as claimed in Claim 61 would not be readily discerned or "clearly envisaged" using the broad ranges of Narita as a guide. It is

respectfully submitted that Narita could not reasonably be considered to teach, suggest, disclose, or render obvious the present invention as claimed.

It is thus submitted that the very large ranges for the mentioned eight glass components of Narita cover a great number of different types of borosilicate glass.

1b. Applicants' Invention:

Applicants' Claim 61 states:

"A glass comprising:
a substantially alkali-free aluminoborosilicate glass;
said glass having the composition (in % by weight, based on oxide):

SiO_2	> 58 - 65
B_2O_3	> 6 - 11.5
Al_2O_3	> 14 - 25
MgO	4 - 8
CaO	0 - 8
SrO	2.6 - < 4
BaO	**0 - < 0.5**
with SrO + BaO	> 3
ZnO	0.5 - 2;

said composition of said SiO_2, said B_2O_3, said Al_2O_3, said MgO, said CaO, said SrO, said BaO, said SrO + BaO, and said ZnO being selected to provide all of (i.), (ii.), (iii.), and (iv.), wherein (i.), (ii.), (iii.), and (iv.) comprise:

(i.) a coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K;

(ii.) a glass transition temperature, T_g, of more than 713 degrees Celsius to maximize heat resistance of said glass;

(iii.) a temperature at a viscosity of 10^2 dPas of at most 1694 degrees Celsius; and

(iv.) a processing temperature, V_A, at a viscosity of 10^4 dPas of at most 1273 degrees Celsius." (emphasis added)

It is submitted that Applicants' Claim 61 claims a **selection invention** of a selection of specific ranges for the specific

components of the claimed glass. The ranges of the present invention include only a very small portion of the ranges of Narita. Therefore, Narita is a non-teaching reference. The specific characteristics of the present invention result only by selecting the very specific ranges of the specific components. Since there is nothing in Narita that would point to the specific ranges of the specific components of the present invention, it is further submitted that Applicants' selection invention is not obvious over Narita.

In the following, the distinctions between the glass of Narita and the glass of Applicants' Claim 61 are analyzed in detail and the analysis is summarized in the following Table 1.

Table 1 - Comparison Of Glass Of Narita And Glass Of Applicants' Claim 61

Component or Sum of Components	Narita's Ranges of Components	Overlap between Applicants' Ranges of Components and Narita's Ranges of Components	Ratio of Applicants' Ranges of Components to Narita's Ranges of Components	Running Probability
SiO_2	30%	7%	0.233	1 in 4
B_2O_3	15%	5.5%	0.366	1 in 12
Al_2O_3	19%	11%	0.5789	1 in 20
MgO	10%	4%	0.40	1 in 51
CaO	15%	8%	0.533	1 in 96
SrO	10%	1.4%	0.14	1 in 690
BaO	30%	0.5%	0.0166	1 in 41,667
ZnO	10%	1.5%	0.15	1 in 277,777
SrO + BaO	40%	1.5%	0.0375	1 in 7,407,407

1c. Explanation of Ranges of Components:

1c. (A) Ranges for Silic n Dioxide and for Boric Oxide:

Narita discloses a range of 40 wt% to 70 wt% of SiO_2. Therefore, the total numerical range of SiO_2 that is disclosed in Narita is the difference between 70 wt% and 40 wt% which is 30 wt%. In other words, the part of the 100% possible range of SiO_2 in Narita is 30%, or, expressed in fractional form rather than in terms of percentage, is 0.30 of the possible range of SiO_2. The value of 0.30, or more than one quarter of the possible range of SiO_2, is a substantial part of the possible 100% range of SiO_2.

Narita discloses a range of 5 wt% to 20 wt% of B_2O_3. Therefore, the total numerical range of B_2O_3 that is disclosed in Narita is the difference between 20 wt% and 5 wt% which is 15 wt%. In other words, the part of the 100% possible range of B_2O_3 in Narita is 15%, or, expressed in fractional form rather than in terms of percentage, is 0.15 of the possible range of B_2O_3. The value of 0.15 of the possible range of B_2O_3, is a moderately substantial part of the possible 100% range of B_2O_3.

In contrast to Narita, Applicants' Claim 61 claims a range of SiO_2 from more than 58 wt% to 65 wt%. Therefore, the total numerical range of SiO_2 that is claimed in Applicants' Claim 61 is the difference between 65 wt% and 58 wt% which is 7 wt%. In other words, the part of the 100% possible range of SiO_2 claimed in Claim 61 is 7%, or, expressed in fractional form rather than in terms of percentage, is 0.07 of the possible range of SiO_2. The value of 0.07 of the possible range of SiO_2 is a small part of the possible 100 % range of SiO_2.

Further in contrast to Narita, Applicants' Claim 61 claims a range of B_2O_3 from more than 6 wt% to 11.5 wt%. Therefore, the

total numerical range of B_2O_3 that is claimed in Applicants' Claim 61 is the difference between 11.5 wt% and 6 wt% which is 5.5 wt%. In other words, the part of the 100% possible range of B_2O_3 claimed in Claim 61 is 5.5 %, or, expressed in fractional form rather than in terms of percentage, is 0.055 of the possible range of B_2O_3. The value of 0.055 of the possible range of B_2O_3 is a small part of the possible 100% range of B_2O_3.

For SiO_2, Narita discloses a range of 30 wt% and Applicants' Claim 61 claims a range of 7 wt%. The quotient of 7 wt% over 30 wt% represents the ratio of the range of SiO_2 as claimed in Claim 61 compared to the range of SiO_2 as disclosed in Narita. The quotient is 0.233. In other words, for SiO_2, the 7% of the range of Claim 61 is only 23% of the range of Narita, which range of Narita is 30% of the 100% possible range of Narita.

For B_2O_3, Narita discloses a range of 15 wt% and Applicants' Claim 61 claims a range of 5.5 wt%. The quotient of 5.5 wt% over 15 wt% represents the ratio of the range of B_2O_3 as claimed in Claim 61 compared to the range of B_2O_3 as disclosed in Narita. The quotient is 0.366. In other words, for B_2O_3, the 5.5% of the range of Claim 61 is only 36% of the range of Narita, which range of Narita is 15% of the 100% possible range of Narita.

As is well known in the mathematics of combinations and probabilities, when two sub-ranges of two separate possible ranges are considered, the portion of the total range of the two separate possible ranges that these ranges take up is the product of the fraction that the first range takes up in the first possible range times the fraction that the second range takes up in the second possible range.

Expressed differently, the probability of all the possible ranges

and the position of all the possible ranges that the two ranges of SiO_2 and B_2O_3 occupy in the two possible greater ranges, that is to say, of all the possible ranges in the two large ranges, that is, in the case of SiO_2, 30 wt% for Narita and 7 wt% for Claim 61 and, in the case of B_2O_3, 15 wt% for Narita and 5.5 wt% for Claim 61, is the product of 0.233 times 0.366, which is equal to 0.0852.

Expressed differently, the probability that the two ranges of SiO_2 and B_2O_3 would encompass the ranges of Claim 61 is 0.0852 or 8.5%.

Thus, in the case of a 0.233 chance for SiO_2 and a 0.366 chance for B_2O_3, the probability that these two would exist together in Applicants' Claim 61 on the basis of Narita is only a 8.5% chance. That means that 91.5% of the possible ranges of SiO_2 and B_2O_3 would lie outside of the ranges claimed for SiO_2 and B_2O_3. In other words, the possibility that these two ranges would be in different positions in the ranges of Narita is 91.5% and would lie outside the ranges claimed in Claim 61.

It is submitted that the low percentage of 8.5% is a very small percentage of the total range of possibilities as suggested in Narita. The reciprocal of 0.0852 is 12. In other words, Applicants' Claim 61 covers only $^1/_{12}$ of the ranges as disclosed by Narita for the two components, SiO_2 and B_2O_3.

Accordingly, the probability of a person skilled in the art choosing the ranges of Claim 61 of from more than of 58 wt% to 65 wt% for SiO_2 and of from more than 6 wt% to 11.5 wt% for B_2O_3, while being aware of the ranges of from 40 wt% to 70 wt% for SiO_2 and of from 5 wt% to 20 wt% for B_2O_3 in Narita, is **only 8.5%**. Therefore, 91.5% of the possible ranges for SiO_2 and B_2O_3 of Narita represent the probability of being outside of the claimed ranges for SiO_2 and B_2O_3. In contrast, Applicants' Claim 61 covers only a $^1/_{12}$

probability of the ranges as disclosed in Narita.

Thus, Applicants' Claim 61 claims a very small range, which represents a very small probability, of SiO_2 and B_2O_3 compared to these two components of Narita. Therefore, Narita does not make obvious Applicants' Claim 61 with respect to the ranges of SiO_2 and B_2O_3.

1c. (B) Ranges for Aluminum Oxide:

Narita discloses a range of 6 wt% to 25 wt% of Al_2O_3. Therefore, the total numerical range of Al_2O_3 that is disclosed in Narita is the difference between 25 wt% and 6 wt% which is 19 wt%. In other words, the part of the 100% possible range of Al_2O_3 in Narita is 19%, or, expressed in fractional form rather than in terms of percentage, is 0.19 of the possible range of Al_2O_3. The value of 0.19 is a moderately substantial part of the possible 100% range of Al_2O_3.

In contrast to Narita, Applicants' Claim 61 claims a range of Al_2O_3 from more than 14 wt% to 25 wt%. Therefore, the total numerical range of Al_2O_3 that is claimed in Applicants' Claim 61 is the difference between 25 wt% and 14 wt% which is 11 wt%. In other words, the part of the 100% possible range of Al_2O_3 claimed in Claim 61 is 11%, or, expressed in fractional form rather than in terms of percentage, is 0.11 of the possible range of Al_2O_3. The value of 0.11 of the possible range of Al_2O_3 is a moderately substantial part of the possible 100% range of Al_2O_3.

For Al_2O_3, Narita discloses a range of 19 wt% and Applicants' Claim 61 claims a range of 11 wt%. The quotient of 11 wt% over 19 wt% represents the ratio of the range of Al_2O_3 as claimed in Claim 61 compared to the range of Al_2O_3 as disclosed in Narita. The quotient is 0.5789. In other words, for Al_2O_3, the 11% of the range of Claim 61 is 58% of the range of Narita, which range of Narita is 19% of the

100% possible range of Narita.

Applying the above-described probability calculation to the three glass components, SiO_2, B_2O_3, and Al_2O_3, the probability that the three ranges would encompass the ranges of Claim 61 is 0.0852 times 0.5789 which is 0.049 or 4.9%.

Thus, in the case of a 0.233 chance for SiO_2, a 0.366 chance for B_2O_3, and a 0.5789 chance for Al_2O_3, the probability that these three would exist together in Applicants' Claim 61 on the basis of Narita is only a 4.9% chance. That means that 95.1% of the possible ranges of SiO_2, B_2O_3 and Al_2O_3 would lie outside of the ranges claimed for SiO_2, B_2O_3, and Al_2O_3. In other words, the possibility that these three ranges would be in different positions in the ranges of Narita is 95.1% and would lie outside the ranges claimed in Claim 61.

It is again submitted that the low percentage of 4.9% is a very small percentage of the total range of possibilities as suggested in Narita. The reciprocal of 0.049 is 20. In other words, Applicants' Claim 61 covers only $^1/_{20}$ of the ranges as disclosed by Narita for the three components, SiO_2, B_2O_3, and Al_2O_3.

Accordingly, since the probability of a person skilled in the art choosing the ranges of Claim 61 of from more than of 58 wt% to 65 wt% for SiO_2, of from more than 6 wt% to 11.5 wt% for B_2O_3, and of from more than 14 wt% to 25 wt% for Al_2O_3, while being aware of the ranges of from 40 wt% to 70 wt% for SiO_2, of from 5 wt% to 20 wt% for B_2O_3, and of from 6 wt% to 25 wt% for Al_2O_3 in Narita, is **only 4.9%**. Therefore 95.1% of the possible ranges for SiO_2, B_2O_3, and Al_2O_3 for Narita represent the probability of being outside of the claimed ranges for SiO_2, B_2O_3, and Al_2O_3. In contrast, Applicants' Claim 61 covers only $^1/_{20}$ probability of the ranges as disclosed in Narita.

Thus, Applicants' Claim 61 claims a very small range, which represents a very small probability, of SiO_2, B_2O_3, and Al_2O_3 compared to these three components of Narita. Therefore, Narita does not make obvious Applicants' Claim 61 with respect to the ranges of SiO_2, B_2O_3, and Al_2O_3.

1c. (C) Ranges for Magnesium Oxide:

Narita discloses a range of 0 wt% to 10 wt% of MgO. Therefore, the total numerical range of MgO that is disclosed by Narita is the difference between 10 wt% and 0 wt% which is 10 wt%. In other words, the part of the 100% possible range of MgO in Narita is 10%, or, expressed in fractional form rather than in terms of percentage, is 0.10 of the possible range of MgO. The value of 0.1 is a moderately substantial part of the possible 100% range of MgO.

In contrast to Narita, Applicants' Claim 61 claims a range of MgO from 4 wt% to 8 wt%. Therefore, the total numerical range of MgO that is claimed in Applicants' Claim 61 is the difference between 8 wt% and 4 wt% which is 4 wt%. In other words, the part of the 100% possible range of MgO claimed in Claim 61 is 4%, or, expressed in fractional form rather than in terms of percentage, is 0.04 of the possible range of MgO. The value of 0.04 of the possible range of MgO is a small part of the possible 100% range of MgO.

For MgO, Narita discloses a range of 10 wt% and Applicants' Claim 61 claims a range of 4 wt%. The quotient of 4 wt% over 10 wt% represents the ratio of the range of MgO as claimed in Claim 61 compared to the range of MgO as disclosed in Narita. The quotient is 0.4. In other words, for MgO, the 4% of the range of Claim 61 is 40% of the range of Narita, which range of Narita is 10% of the 100% possible range of Narita.

Applying the above-described probability calculation to the four glass components, SiO_2, B_2O_3, Al_2O_3, and MgO, the probability that the four ranges would encompass the ranges of Claim 61 is 0.049 times 0.4 which is 0.0196 or 2%.

Thus, in the case of a 0.233 chance for SiO_2, a 0.366 chance for B_2O_3, a 0.5789 chance for Al_2O_3, and a 0.4 chance for MgO, the probability that these four would exist together in Applicants' Claim 61 on the basis of Narita is only a 2% chance. That means that 98% of the possible ranges of SiO_2, B_2O_3, Al_2O_3 and MgO would lie outside of the ranges claimed for SiO_2, B_2O_3, Al_2O_3, and MgO. In other words, the possibility that these four ranges would be in different positions in the ranges of Narita is 98% and would lie outside the ranges claimed in Claim 61.

It is again submitted that the low percentage of 2% is a very small percentage of the total range of possibilities as suggested in Narita. The reciprocal of 0.0196 is 51. In other words, Applicants' Claim 61 covers only $^1/_{51}$ of the ranges as disclosed by Narita for the four components, SiO_2, B_2O_3, Al_2O_3, and MgO.

Accordingly, the probability of a person skilled in the art choosing the ranges of Claim 61 of from more than of 58 wt% to 65 wt% for SiO_2, of from more than 6 wt% to 11.5 wt% for B_2O_3, of from more than 14 wt% to 25 wt% for Al_2O_3, and of from 4 wt% to 8 wt% for MgO, while being aware of the ranges of from 40 wt% to 70 wt% for SiO_2, of from 5 wt% to 20 wt% for B_2O_3, of from 6 wt% to 25 wt% for Al_2O_3, and of from 0 wt% to 10 wt% for MgO in Narita, is **only 2%**. Therefore, 98% of the possible ranges for SiO_2, B_2O_3, Al_2O_3, and MgO of Narita represent the probability of being outside of the claimed ranges for SiO_2, B_2O_3, Al_2O_3, and MgO. In contrast, Applicants' Claim 61 covers only $^1/_{51}$ probability of the ranges as

disclosed in Narita.

Thus, Applicants' Claim 61 claims a very small range, which represents a very small probability, of SiO_2, B_2O_3, Al_2O_3, and MgO compared to these four components of Narita. Therefore, Narita does not make obvious Applicants' Claim 61 with respect to the ranges of SiO_2, B_2O_3, Al_2O_3, and MgO.

<u>1-c. (D) Ranges For Calcium Oxide:</u>

Narita discloses a range of 0 wt% to 15 wt% of CaO. Therefore, the total numerical range of CaO that is disclosed in Narita is the difference between
15 wt% and 0 wt% which is 15 wt%. In other words, the part of the 100% possible range of CaO in Narita is 15%, or, expressed in fractional form rather than in terms of percentage, is 0.15 of the possible range of CaO. The value of 0.15 is a moderately substantial part of the possible 100% range of CaO.

In contrast to Narita, Applicants' Claim 61 claims a range of CaO from 0 wt% to 8 wt%. Therefore, the total numerical range of CaO that is claimed in Applicants' Claim 61 is the difference between 8 wt% and 0 wt% which is 8 wt%. In other words, the part of the 100% possible range of CaO claimed in Claim 61 is 8%, or, expressed in fractional form rather than in terms of percentage, is 0.08 of the possible range of CaO. The value of 0.08 of the possible range of CaO is a small part of the possible 100% range of CaO.

For CaO, Narita discloses a range of 15 wt% and Applicants' Claim 61 claims a range of 8 wt%. The quotient of 8 wt% over 15 wt% represents the ratio of the range of CaO as claimed in Claim 61 compared to the range of CaO as disclosed in Narita. The quotient is 0.533. In other words, for CaO, the 8% of the range of Claim 61 is 53.3% of the range of Narita, which range of Narita is 15% of the

100% possible range of Narita.

Applying the above-described probability calculation to the five glass components, SiO_2, B_2O_3, Al_2O_3, MgO, and CaO, the probability that the five ranges would encompass the ranges of Claim 61 is 0.0196 times 0.533 which is 0.0104 or 1.0%.

Thus, in the case of a 0.233 chance for SiO_2, a 0.366 chance for B_2O_3, a 0.5789 chance for Al_2O_3, a 0.4 chance for MgO, and a 0.533 chance for CaO, the probability that these five would exist together in Applicants' Claim 61 on the basis of Narita is only a 1% chance. That means that 99% of the possible ranges of SiO_2, B_2O_3, Al_2O_3, MgO, and CaO would lie outside of the ranges claimed for SiO_2, B_2O_3, Al_2O_3, MgO, and CaO. In other words, the possibility that these five ranges would be in different positions in the ranges of Narita is 99% and would lie outside the ranges claimed in Claim 61.

It is again submitted that the low percentage of 1% is a very small percentage of the total range of possibilities as suggested in Narita. The reciprocal of 0.0104 is 96. In other words, Applicants' Claim 61 covers only $^{1}/_{96}$ of the ranges as disclosed by Narita for the five components, SiO_2, B_2O_3, Al_2O_3, MgO, and CaO.

Accordingly, the probability of a person skilled in the art choosing the ranges of Claim 61 of from more than of 58 wt% to 65 wt% for SiO_2, of from more than 6 wt% to 11.5 wt% for B_2O_3, of from more than 14 wt% to 25 wt% for Al_2O_3, of from 4 wt% to 8 wt% for MgO, and of from 0 wt% to 8 wt% for CaO, while being aware of the ranges of from 40 wt% to 70 wt% for SiO_2, of from 5 wt% to 20 wt% for B_2O_3, of from 6 wt% to 25 wt% for Al_2O_3, of from 0 wt% to 10 wt% for MgO, and of from 0 wt% to 15 wt% for CaO in Narita, is **only 1%**. Therefore, 99% of the possible ranges for SiO_2, B_2O_3, Al_2O_3, and MgO of Narita represent the probability of being outside of

the claimed ranges for SiO_2, B_2O_3, Al_2O_3, and MgO. In contrast, Applicants' Claim 61 covers only a $^1/_{96}$ probability of the ranges as disclosed in Narita.

Thus, Applicants' Claim 61 claims a very small range, which represents a very small probability, of SiO_2, B_2O_3, Al_2O_3, and MgO compared to these four components of Narita. Therefore, Narita does not make obvious Applicants' Claim 61 with respect to the ranges of SiO_2, B_2O_3, Al_2O_3, and MgO.

1c. (E) Ranges for Strontium Oxide:

Narita discloses a range of 0 wt% to 10 wt% of SrO. Therefore, the total numerical range of SrO that is disclosed in Narita is the difference between 10 wt% and 0 wt% which is 10 wt%. In other words, the part of the 100% possible range of SrO in Narita is 10%, or, expressed in fractional form rather than in terms of percentage, is 0.10 of the possible range of SrO. The value of 0.10 is a moderately substantial part of the possible 100% range of SrO.

In contrast to Narita, Applicants' Claim 61 claims a range of SrO from 2.6 wt% to 4 wt%. Therefore, the total numerical range of SrO that is claimed in Applicants' Claim 61 is the difference between 4 wt% and 2.6 wt% which is 1.4 wt%. In other words, the part of the 100% possible range of SrO claimed in Claim 61 is 1.4%, or, expressed in fractional form rather than in terms of percentage, is 0.014 of the possible range of SrO. The value of 0.014 of the possible range of SrO is a small part of the possible 100% range of SrO.

For SrO, Narita discloses a range of 10 wt% and Applicants' Claim 61 claims a range of 1.4 wt%. The quotient of 1.4 wt% over 10 wt% represents the ratio of the range of SrO as claimed in Claim 61 compared to the range of SrO as disclosed in Narita. The

quotient is 0.14. In other words, for SrO, the 1.4% of the range of Claim 61 is 14% of the range of Narita, which range of Narita is 10% of the 100% possible range of Narita.

Applying the above-described probability calculation to the six glass components, SiO_2, B_2O_3, Al_2O_3, MgO, CaO, and SrO, the probability that the six ranges would encompass the ranges of Claim 61 is 0.0104 times 0.14 which is 0.00145 or 0.145%.

Thus, in the case of a 0.233 chance for SiO_2, a 0.366 chance for B_2O_3, a 0.5789 chance for Al_2O_3, a 0.4 chance for MgO, a 0.533 chance for CaO, and a 0.14 chance for SrO, the probability that these six would exist together in Applicants' Claim 61 on the basis of Narita is only a 0.145% chance. That means that 99.855% of the possible ranges of SiO_2, B_2O_3, Al_2O_3, MgO, CaO, and SrO would lie outside of the ranges claimed for SiO_2, B_2O_3, Al_2O_3, MgO, CaO, and SrO. In other words, the possibility that these six ranges would be in different positions in the ranges of Narita is 99.855% and would lie outside the ranges claimed in Claim 61.

It is again submitted that the low percentage of 0.145% is a very small percentage of the total range of possibilities as suggested in Narita. The reciprocal of 0.00145 is 690. In other words, Applicants' Claim 61 covers only $^1/_{690}$ of the ranges as disclosed by Narita for the six components, SiO_2, B_2O_3, Al_2O_3, MgO, CaO, and SrO.

Accordingly, the probability of a person skilled in the art choosing the ranges of Claim 61 of from more than of 58 wt% to 65 wt% for SiO_2, of from more than 6 wt% to 11.5 wt% for B_2O_3, of from more than 14 wt% to 25 wt% for Al_2O_3, of from 4 wt% to 8 wt% for MgO, of from 0 wt% to 8 wt% for CaO, and of from 2.6 wt% to 4 wt% for SrO, while being aware of the ranges of from 40 wt% to 70 wt% for SiO_2, of from 5 wt% to 20 wt% for B_2O_3, of from 6 wt% to 25 wt%

for Al_2O_3, of from 0 wt% to 10 wt% for MgO, of from 0 wt% to 15 wt% for CaO, and of from 0 wt% to 10 wt% for SrO in Narita, is **only 0.145%**. Therefore, 99.855% of the possible ranges for SiO_2, B_2O_3, Al_2O_3, MgO and SrO of Narita represent the probability of being outside of the claimed ranges for SiO_2, B_2O_3, Al_2O_3, MgO and SrO. In contrast, Applicants' Claim 61 covers only a $^1/_{690}$ probability of the range as disclosed in Narita.

Thus, Applicants' Claim 61 claims a very small range, which represents a very small probability, of SiO_2, B_2O_3, Al_2O_3, MgO and SrO compared to these six components of Narita. Therefore, Narita does not make obvious Applicants' Claim 61 with respect to the ranges of SiO_2, B_2O_3, Al_2O_3, MgO and SrO.

1c. (F) Ranges for Barium Oxide:

Narita discloses the large range of 0 wt% to 30 wt% of BaO. Therefore, the total numerical range of BaO that is disclosed in Narita is the difference between 30 wt% and 0 wt% which is 30 wt%. In other words, the part of the 100% possible range of BaO in Narita is 30%, or, expressed in fractional form rather than in terms of percentage, is 0.30 of the possible range of BaO. The value of 0.30 is a moderately substantial part of the possible 100% range of BaO.

In contrast to Narita, Applicants' Claim 61 claims a range of BaO from 0 wt% to 0.5 wt%. Therefore, the total numerical range of BaO that is claimed in Applicants' Claim 61 is the difference between 0.5 wt% and 0 wt% which is 0.5 wt%. In other words, the part of the 100% possible range of BaO claimed in Claim 61 is 0.5%, or, expressed in fractional form rather than in terms of percentage, is 0.05 of the possible range of BaO. The value of 0.05 of the possible range of BaO is a small part of the possible 100% range of BaO.

For BaO, Narita discloses a range of 30 wt% and Applicants' Claim 61 claims a range of 0.5 wt%. The quotient of 3.5 wt% over 30 wt% represents the ratio of the range of BaO as claimed in Claim 61 compared to the range of BaO as disclosed in Narita. The quotient is 0.0166. In other words, for BaO, the 0.5% of the range of Claim 61 is 1.6% of the range of Narita, which range of Narita is 30% of the 100% possible range of Narita.

Applying the above-described probability calculation to the seven glass components, SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, and BaO, the probability that the seven ranges would encompass the ranges of Claim 61 is 0.00145 times 0.0166 which is 0.000024 or 0.0024%.

Thus, in the case of a 0.233 chance for SiO_2, a 0.366 chance for B_2O_3, a 0.5789 chance for Al_2O_3, a 0.4 chance for MgO, a 0.533 chance for CaO, a 0.14 chance for SrO, and a 0.0166 chance for BaO, the probability that these seven would exist together in Applicants' Claim 61 on the basis of Narita is only a 0.0024% chance. That means that 99.9976% of the possible ranges of SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, and BaO would lie outside of the ranges claimed for SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, and BaO. In other words, the possibility that these seven ranges would be in different positions in the ranges of Narita is 99.9976% and would lie outside the ranges claimed in Claim 61.

It is again submitted that the low percentage of 0.0024% is a very small percentage of the total range of possibilities as suggested in Narita. The reciprocal of 0.000024 is 41,667. In other words, Applicants' Claim 61 covers only $^1/_{41667}$ of the ranges as disclosed by Narita for the seven components, SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, and BaO.

Accordingly, the probability of a person skilled in the art

choosing the ranges of Claim 61 of from more than of 58 wt% to 65 wt% for SiO_2, of from more than 6 wt% to 11.5 wt% for B_2O_3, of from more than 14 wt% to 25 wt% for Al_2O_3, of from 4 wt% to 8 wt% for MgO, of from 0 wt% to 8 wt% for CaO, of from 2.6 wt% to 4 wt% for SrO, and of from 0 wt% to 0.5 wt% for BaO, while being aware of the ranges of from 40 wt% to 70 wt% for SiO_2, of from 5 wt% to 20 wt% for B_2O_3, of from 6 wt% to 25 wt% for Al_2O_3, of from 0 wt% to 10 wt% for MgO, of from 0 wt% to 15 wt% for CaO, of from 0 wt% to 10 wt% for SrO, and of from 0 wt% to 30 wt% for BaO in Narita, is **only 0.0024%**. Therefore, 99.9976% of the possible ranges for SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, and BaO of Narita represent the probability of being outside of the claimed ranges for SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, and BaO. In contrast, Applicants' Claim 61 covers only a $^1/_{41667}$ probability of the ranges as disclosed in Narita.

Thus, Applicants' Claim 61 claims a very small range, which represents a very small probability, of SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, and BaO compared to these seven components of Narita. Therefore, Narita does not make obvious Applicants' Claim 61 with respect to the ranges of SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, and BaO.

1c. (G) Ranges for Zinc Oxide:

Narita discloses the range of 0 wt% to 10 wt% of ZnO. Therefore, the total numerical range of ZnO that is disclosed in Narita is the difference between 10 wt% and 0 wt% which is 10 wt%. In other words, the part of the 100% possible range of BaO in Narita is 10%, or, expressed in fractional form rather than in terms of percentage, is 0.10 of the possible range of ZnO. The value of 0.10 is a moderately substantial part of the possible 100% range of ZnO.

In contrast to Narita, Applicants' Claim 61 claims a range of ZnO from 0.5 wt% to less than 2 wt%. Therefore, the total numerical

range of ZnO that is claimed in Applicants' Claim 61 is the difference between 2 wt% and 0.5 wt% which is 1.5 wt%. In other words, the part of the 100% possible range of ZnO claimed in Claim 61 is 1.5%, or, expressed in fractional form rather than in terms of percentage, is 0.015 of the possible range of ZnO. The value of 0.015 of the possible range of ZnO is a small part of the possible 100% range of ZnO.

For ZnO, Narita discloses a range of 10 wt% and Applicants' Claim 61 claims a range of 1.5 wt%. The quotient of 1.5 wt% over 10 wt% represents the ratio of the range of ZnO as claimed in Claim 61 compared to the range of ZnO as disclosed in Narita. The quotient is 0.15. In other words, for ZnO, the 1.5% of the range of Claim 61 is 15% of the range of Narita, which range of Narita is 10% of the 100% possible range of Narita.

Applying the above-described probability calculation to the eight glass components, SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO, the probability that the eight ranges would encompass the ranges of Claim 61 is 0.000024 times 0.15 which is 0.0000036 or 0.00036% or 3.6×10^{-4}%.

Thus, in the case of a 0.233 chance for SiO_2, a 0.366 chance for B_2O_3, a 0.5789 chance for Al_2O_3, a 0.4 chance for MgO, a 0.533 chance for CaO, a 0.14 chance for SrO, a 0.0166 chance for BaO, and a 0.15 chance for ZnO, the probability that these eight would exist together in Applicants' Claim 61 on the basis of Narita is only a 3.6×10^{-4}% chance. That means that 99.99964% of the possible ranges of SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO would lie outside of the ranges claimed for SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO.. In other words, the possibility that these eight ranges would be in different positions in the ranges of Narita is 99.99964%

and would lie outside the ranges claimed in Claim 61.

It is again submitted that the low percentage of 0.00036% is a very small percentage of the total range of possibilities as suggested in Narita. The reciprocal of 0.0000036 is 277,777. In other words, Applicants' Claim 61 covers only $^{1}/_{277777}$ of the ranges as disclosed by Narita for the eight components, SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO.

Accordingly, the probability of a person skilled in the art choosing the ranges of Claim 61 of from more than of 58 wt% to 65 wt% for SiO_2, of from more than 6 wt% to 11.5 wt% for B_2O_3, of from more than 14 wt% to 25 wt% for Al_2O_3, of from 4 wt% to 8 wt% for MgO, of from 0 wt% to 8 wt% for CaO, of from 2.6 wt% to 4 wt% for SrO, of from 0 wt% to 0.5 wt% for BaO, and of from 0.5 wt% to 2 wt% for ZnO, while being aware of the ranges of from 40 wt% to 70 wt% for SiO_2, of from 5 wt% to 20 wt% for B_2O_3, of from 6 wt% to 25 wt% for Al_2O_3, of from 0 wt% to 10 wt% for MgO, of from 0 wt% to 15 wt% for CaO, of from 0 wt% to 10 wt% for SrO, of from 0 wt% to 30 wt% for BaO, and of from 0 wt% to 10 wt% for ZnO in Narita, is **only 3.6×10^{-4}%**. Therefore, 99.99964% of the possible ranges for SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO of Narita represent the probability of being outside of the claimed ranges for SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO. In contrast, Applicants' Claim 61 covers only a $^{1}/_{277777}$ probability of the ranges as disclosed in Narita.

Thus, Applicants' Claim 61 claims a very small range, which represents a very small probability, of SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO compared to these eight components of Narita. Therefore, Narita does not make obvious Applicants' Claim 61 with respect to the ranges of SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and

ZnO.

1c. (H) Ranges for Sum of Strontium Oxide Plus Barium Oxid :

For the sum of SrO plus BaO Applicants claim a value of more than 3 wt%. Please note that, however, the maximum value of SrO is 4 wt% and the maximum value of BaO is 0.5 wt%. That means that the range for the sum of SrO plus BaO is the difference between 4.5 wt% and 3 wt%, which is 1.5 wt%.

Narita does not disclose any range for the sum of SrO plus BaO.

However, for the completeness of the presentation regarding Claim 61, in the following the probability of such limits using the foregoing calculation is presented.

Narita discloses the range of 0 wt% to 10 wt% of SrO. Therefore, the total numerical range of SrO that is disclosed in Narita is the difference between 10 wt% and 0 wt% which is 10 wt%.

Narita discloses the very large range of 0 wt% to 30 wt% of BaO. Therefore, the total numerical range of BaO that is disclosed in Narita is the difference between 30 wt% and 0 wt% which is 30 wt%.

In the case of Narita, the sum of SrO plus BaO is 10 wt% of SrO plus 30 wt% of BaO which is equal to 40 wt%.

In contrast to Narita, Applicants' Claim 61 claims a value of more than 3 wt% for SrO plus BaO or a minimum of 3 wt% for SrO plus BaO. Applicants' Claim 61 claims a maximum value for SrO of 4 wt% and a maximum value for BaO of 0.5 wt% for a total maximum value of SrO plus BaO of 4.5 wt%. Therefore, the total numerical range of SrO plus BaO that is claimed in Applicants' Claim 61 is the difference between 3.0 wt% and 4.5 wt% which is 1.5 wt%.

For SrO plus BaO, Narita discloses a range of 40 wt% and Applicants' Claim 61 claims a range of 1.5 wt%. The quotient of 1.5

wt% over 40 wt% represents the ratio of the range of SrO plus BaO as claimed in Claim 61 compared to the range of SrO plus BaO as disclosed in Narita. The quotient is 0.0375. In other words, for SrO plus BaO, the 1.5% of the range of Claim 61 is 3.75% of the range of Narita, which range of Narita is 40% of the 100% possible range of Narita.

Applying the above-described probability calculation to the eight glass components, SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO, and the sum of SrO plus BaO, the probability that the nine ranges would encompass the ranges of Claim 61 is 0.0000036 times 0.0375 which is 0.0000000135 or 0.00000135% or 1.35×10^{-6}%.

Thus, in the case of a 0.233 chance for SiO_2, a 0.366 chance for B_2O_3, a 0.5789 chance for Al_2O_3, a 0.4 chance for MgO, a 0.533 chance for CaO, a 0.14 chance for SrO, a 0.0166 chance for BaO, a 0.15 chance for ZnO, and a 0.0375 chance for the sum of SrO plus BaO, the probability that these nine would exist together in Applicants' Claim 61 on the basis of Narita is only a 1.35×10^{-6}%. That means that 99.99999865% of the possible ranges of SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO, and the sum of SrO plus BaO would lie outside of the ranges claimed for SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO, and the sum of SrO plus BaO. In other words, the possibility that these nine ranges would be in different positions in the ranges of Narita is 99.99999865% and would lie outside the ranges claimed in Claim 61.

It is again submitted that the low percentage of 1.35×10^{-6}% is an extremely small percentage of the total range of possibilities as suggested in Narita. The reciprocal of 0.0000000135 is 7,407,407. In other words, Applicants' Claim 61 covers only $^1/_{7407407}$ of the ranges as disclosed by Narita for the eight components, SiO_2, B_2O_3, Al_2O_3,

MgO, CaO, SrO, BaO, and ZnO, and the sum of SrO plus BaO.

Accordingly, the probability of a person skilled in the art choosing the ranges of Claim 61 of from more than of 58 wt% to 65 wt% for SiO_2, of from more than 6 wt% to 11.5 wt% for B_2O_3, of from more than 14 wt% to 25 wt% for Al_2O_3, of from 4 wt% to 8 wt% for MgO, of from 0 wt% to 8 wt% for CaO, of from 2.6 wt% to 4 wt% for SrO, of from 0 wt% to 0.5 wt% for BaO, and of from 0.5 wt% to 2 wt% for ZnO, with the sum of SrO plus BaO of from 2.6 wt% to 4 wt%, while being aware of the ranges of from 40 wt% to 70 wt% for SiO_2, of from 5 wt% to 20 wt% for B_2O_3, of from 6 wt% to 25 wt% for Al_2O_3, of from 0 wt% to 10 wt% for MgO, of from 0 wt% to 15 wt% for CaO, of from 0 wt% to 10 wt% for SrO, of from 0 wt% to 30 wt% for BaO, and of from 0 wt% to 10 wt% for ZnO, and with the sum of SrO plus BaO of 40 wt% in Narita, is **only 1.35×10^{-6}%**. Therefore, 99.99999865% of the possible ranges for SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO, and the sum of SrO plus BaO of Narita represent the probability of being outside of the claimed ranges for SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO, and the sum of SrO plus BaO. In contrast, Applicants' Claim 61 covers only a $^1/_{7407407}$ probability as disclosed in Narita.

Thus, Applicants' Claim 61 claims an extremely small range, which represents an extremely small probability, of SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO, and the sum of SrO plus BaO compared to the these eight components and the sum of SrO plus BaO of Narita. Therefore, Narita does not make obvious Applicants' Claim 61 with respect to the ranges of SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, BaO, and ZnO, and the sum of SrO plus BaO.

1c. (I) Summary of Results:

In summary, multiplication of all the ratios of Applicants' range

of components vs. Narita's range of components reveals a result of 0.0000000135 which corresponds to 0.00000135% or $1.35 \times 10^{-6}\%$.

The low percentage of $1.35 \times 10^{-6}\%$ is an extremely small percentage of the total range of possibilities as suggested in Narita. The reciprocal of 0.0000000135 is 7,407,407. In other words, there are more than **7 million** other ranges covered by Narita of the same scope as the ranges of the present invention. It would be virtually impossible for someone to be able to determine which of the 7 million ranges would be advantageous to cover so as to provide the invention of the present application. Still in other words, Applicants' claim covers only a **1 in 7,407,407** probability of the ranges that are covered by Narita.

Thus, it is not understood how Narita can make Applicants' range obvious. It is submitted that Narita is not applicable as a reference because of the minuscule factor of 1.35×10^{-8}.

It is submitted that the foregoing differences of Applicants' glass alone are sufficient to show the patentable distinction over Narita.

1d. Further Discussion of Distinctions of Claim 61 over Narita:

As mentioned, there is no disclosure in Narita of the sum of SrO plus BaO being between 3 wt% and 4.5 wt%. The importance of a specific BaO content in Applicants' glass will be discussed in further detail herein below.

It is clear from the foregoing comparison, that Applicants' invention is a selection invention of specific and well-defined ranges that are not obvious over Narita. More specifically, Applicants' glass is claimed in terms of small ranges within the very wide ranges of Narita. The specific and well-defined ranges of Applicants' glass from within Narita lead to surprising results as will be discussed in greater

detail below.

Furthermore, please note, as claimed in Claim 61, Applicants' glass contains the specific range of from 0 % to 0.5 % by weight of BaO.

Table 1 of Narita shows five samples, samples a to e. The five samples, a-e, all show a BaO content of 6.0 wt%. The BaO content of 6.0 wt% is outside the BaO content of 0 wt% to 0.5 wt% claimed in Claim 61.

Table 2 of Narita shows six samples, samples e to e-5. The six samples variously show a BaO content of from 3.7 wt% to 4.1 wt%. A BaO content of from 3.7 wt% to 4.1 wt% is outside the BaO content of 0 wt% to 0.5 wt% claimed in Claim 61.

Table 3 of Narita shows five samples, samples 1 to 5. Samples 1 to 5 variously show a BaO content of from 6.0 wt% to 25.0 wt%. A BaO content of from 6.0 wt% to 25.0 wt% is outside the BaO content of 0 wt% to 0.5 wt% claimed in Claim 61.

Table 4 of Narita shows three samples, samples 6 to 8. Sample 6 has no BaO content. However, sample 6 has an MgO content of 9.5 wt% which is greater than the MgO content of 4 wt% to 8% of Claim 61. Samples 7 and 8 show a BaO content of 12.0 wt% and 4 wt%, respectively. A BaO content of 4.0 wt% or 12.0 wt% is outside the BaO content of 0 wt% to 0.5 wt% claimed in Claim 61.

Table 5 of Narita shows five samples, samples 9 to 13. The five samples variously show a BaO content of from 1.0 wt% to 6.0 wt%. A BaO content of from 1.0 wt% to 6.0 wt% is outside the BaO content of 0 wt% to 0.5 wt% claimed in Claim 61.

It is submitted that the glass art is an unpredictable art. Thus, any change in the composition of a glass could not predict the outcome of that glass and thus the outcome would be unpredictable.

Further, what may appear to be a predictable outcome regarding glass compositions is not predictable and any appearance of predictability in this case is based on the use of hindsight, which is improper in determining obviousness.

1e. Discussion of Distinctions of Properties of Claim 61 over Narita:

The glass claimed in Claim 61 has a "**coefficient of thermal expansion** $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K." (emphasis added.) The glass having a BaO content of from more than 5 % to 8.5 % by weight, and the other specific ranges of the other components in Claim 61 result in a low coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K, because the claimed glass composition provides for the network builders that enhance crystallization. In other words, the combination of the components claimed in Claim 61 is formulated in such a way as to produce a low coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K. This permits the glass to have an expansion behavior in the same range as both, amorphous silicon and polycrystalline silicon. Therefore amorphous silicon and polycrystalline silicon can be disposed on the substrate glass as claimed in Claim 61 and the shear between silicon coated on the claimed glass substrate and the glass substrate will be minimized. Furthermore, a low coefficient of thermal expansion as claimed in Claim 61 results in the glass having a high resistance against thermal shock and also having a high temperature strength retention, that is, the glass retains its strength upon being subjected to high temperatures.

Narita, as understood, contains no indication that suggests that the glasses of Narita have a low coefficient of thermal expansion of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K. Therefore, Narita, as

understood, does not suggest or make obvious the combination of the specific composition and the specific ranges and the low coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K of Claim 61.

It is submitted that the present invention is not obvious over Narita based on the foregoing.

It is also submitted that hindsight has been used to reject the claims of the present invention. However the use of hindsight is improper in determining obviousness.

Applicants' glass as claimed in Claim 61 is not obvious in view of Narita further because of the following:

The glass claimed in Claim 61 has the following beneficial and surprising properties.

The combination of the specific claimed ranges of the glass claimed in Claim 61 provides a **high heat resistance** to minimize damage to the glass due to thermal shock on the glass. A heat resistant glass according to the "Dictionary of Ceramic Science and Engineering," by Loran S. O'Bannon, Plenum Press, New York, 1984 comprises:

> "A glass of low-thermal expansion and high resistance to thermal shock such as occurs when the glass is cooled suddenly from an elevated temperature."

1f. Discussion of the Glass Transition Temperature in Context of Claim 61:

The term glass transition temperature is defined in the German publication "ABC GLAS," Deutscher Verlag für Grundstoffindustrie, Leipzig, 1991. The translation of the term is as follows:

> "**Transition temperature**, transition point, freezing point (formula sign T_g) - the temperature value which characterizes the

region of the transformation of the glass melt from the condition of an undercooled or supercooled liquid into a quasi-solid ("frozen") condition (*transformation region, freezing region)*. ...".

As understood, there is no suggestion in Narita of a glass transition temperature, T_g. Further, there is no disclosure in Narita of any interrelationship between a glass transition temperature, T_g,. on the one hand, and both, a melting temperature and a hot shaping temperature, on the other hand.

The glass as claimed in Claim 61, due to its specific composition and the specific ranges of the components, has **a high glass transition temperature, T_g**. A high glass transition temperature, T_g, of a glass provides a high heat resistance which is conducive to minimize damage to the glass due to thermal shock on the glass. Applicants' glass claimed in Claim 61 has a high glass transition temperature, T_g, of more than 713 degrees Celsius.

Even though the claimed glass has a **high** glass transition temperature, T_g, of more than 713 degrees Celsius, due to the claimed combination of glass components and the ranges of the glass components, Applicants' glass, <u>surprisingly,</u> also has both, a **<u>low</u> melting temperature** and a **<u>low</u> hot shaping temperature**.

A low melting temperature is indicated by a low temperature at a viscosity of 10^2 dPas. The present application discloses a temperature at a viscosity of 10^2 dPas of at most 1720 degrees Celsius.

A low hot shaping temperature, also referred to as processing temperature V_A, is indicated by a low temperature at a viscosity of 10^4 dPas. The present application discloses a temperature at a viscosity of 10^4 dPas of at most 1350 degrees Celsius.

It is surprising that Applicants' glass has a **high** glass transition

temperature and also has both, a **low** melting temperature, at a viscosity of 10^2 dPas of at most 1720 degrees Celsius, and a **low** hot shaping temperature, at a viscosity of 10^4 dPas of at most 1350 degrees Celsius.

It is submitted that a person skilled in the art would not expect this relationship and would expect the opposite to be true: That is, that a high glass transition temperature, Tg, of more than 713 degrees Celsius would result in both, a high melting temperature at a viscosity of 10^2 dPas of more than 1720 degrees Celsius, and a high hot shaping temperature, or processing temperature, V_A, at a viscosity of 10^4 dPas of more than 1350 degrees Celsius.

It may be added that most of the glasses of Narita, especially those with a relatively high strain point, contain a low percentage of BaO. A low percentage of BaO means that the crystallization stability of the glasses according to Narita will not be sufficient to permit use of the glass in various flat glass production processes, such as, float methods and the various drawing methods.

The specific BaO content of from 0 % to 0.5 % by weight and the other specific ranges of the other components of the glass permit a sufficient degree of crystallization stability of the glass as claimed in Claim 61. The crystallization stability permits use of the glass in various flat glass production processes, such as, float methods and the various drawing methods.

It is clear from the foregoing that Narita does not make obvious Applicants' Claim 61 and thus Applicants' Claim 61 should be allowed.

1g. Discussion of Dependent Claims 62 and 63 Dependent Upon Claim 61:

It is submitted that the dependent Claims 62 and 63 are allowable based on their dependence from Claim 61. Claim 61 has

been discussed in detail above. Since the combination of the limitations of Claim 61 is not shown or disclosed in Narita, it is submitted that Claims 62 and 63 are not made obvious, and Claims 62 and 63 should be allowed.

2. Discussion of Claim 64 in View of Narita:

As stated above, Claims 44-56 have been canceled. Canceled independent Claim 47 ostensibly corresponds to newly presented independent Claim 64 and the following submission refers to Claim 64.

Specifically, the Examiner stated:

> "Narita teach an alkali-free glass consisting of 40-70 wt% SiO_2, 5-20 wt% B_2O_3, 6-25 wt% Al_2O_3, 0-10 wt% MgO, 0-15 wt% CaO, 0-10 wt% SrO, 0-30 wt% BaO, 0-10 wt% ZnO, 0.05-2 wt% SnO_2, and 0.005-2 wt% Cl_2. See abstract of Narita. Narita teach that glass can be used as a substrate for display technologies. See column 1, lines 7-10. Narita teach that it is preferable not to use Sb_2O_3 and As_2O_3 as fining agents due to toxicity. See column 3, lines 46-47. Narita teach that the glass is free from bubbles that result in display defects. See column 1, lines 49-52. The reference teaches that the glass can be formed by various methods including the downdraw process and the float process. See column 4, lines 11-14.
>
> Narita differ from the instant claims by not teaching specific examples that lie within the compositional ranges nor ranges of glass components which are sufficiently specific to anticipate the claim limitations. However, the compositional ranges of Narita overlap the compositional ranges of claims 44-56. Overlapping ranges have been held to establish prima facie obviousness. See MPEP 2144.05.
>
> Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected from the overlapping portion of the ranges of Narita because overlapping ranges have been held to establish prima facie obviousness.
>
> One of ordinary skill in the art would expect that glasses with overlapping compositional ranges would have overlapping ranges of properties as recited in claims 44-48, 55, and 56."

2a. Narita Disclosure:

With reference to the Abstract, the cited Narita reference

discloses:

"an alkali-free glass consisting of
40-70 wt% SiO_2,
5-20 wt% B_2O_3,
6-25 wt%Al_2O_3,
0-10 wt% MgO,
0-15 wt% CaO,
0-10 wt% SrO,
0-30 wt% BaO,
0-10 wt% ZnO,
0.05-2 wt% SnO_2, and
0.005-2 wt% Cl_2." (emphasis added)

As has been mentioned in connection with the above argument relating to Claim 61, it is submitted that Narita discloses very large ranges for eight of the components of the borosilicate glass.

Narita <u>generally</u> discusses <u>extremely broad</u> ranges of components that either encompass or overlap the ranges in Claim 64. In the abstract of Narita, the broad ranges are set forth as follows:

> An alkali-free glass essentially consists of, by weight percent, 40-70% SiO_2, 6-25% Al_2O_3, 5-20% B_2O_3, 0-10% MgO, 0-15% CaO, 0-30% BaO, 0-10% SrO, 0-10% ZnO, 0.05-2% SnO_2, and 0.005-1% Cl_2, and substantially contains no alkali metal oxide.

It is respectfully submitted that these broad ranges do not provide "sufficient specificity" as required by MPEP 2131.03. MPEP 2131.03 states, in part:

> When the prior art discloses a range which touches, overlaps or is within the claimed range, but no specific examples falling within the claimed range are disclosed, a case by case determination must be made as to anticipation. In order to anticipate the claims, the claimed subject matter must be disclosed in the reference with "sufficient specificity to constitute an anticipation under the statute." What constitutes a "sufficient specificity" is fact dependent. **If the claims are directed to a narr w rang , the ref rence teaches a broad range, and there is evid nce of unexpected results within the claimed**

> **narrow range, d pending on the other facts of the case, it may b reasonable to conclude that the narrow rang is not disclosed with "suffici nt specificity" t constitut an anticipation of the claims.** The unexpected results may also render the claims unobvious. The question of "sufficient specificity" is similar to that of "clearly envisaging" a species from a generic teaching. (emphasis added)

With reference to the above bolded portion of MPEP 2131.03, please note that, in the present application, independent Claims 61 and 64 each set forth relatively narrow ranges in comparison to the broad ranges disclosed in Narita.

In addition, the claimed ranges of the present invention have been found to produce "unexpected results." In the present invention, the composition produces a glass having a very high glass transition temperature, T_g, greater than 700°C. As is known in the art, when the transition temperature is increased, a person of skill in the art would expect a corresponding and substantial increase in the temperature at which workability is reached and the temperature at which melting is achieved. However, the claimed composition produced a glass where the working points and melting points did not increase as a person of skill in the art would expect. This concept has been discussed in much greater depth above, see section *1d. and 1e. Discussion Of Distinctions Of Properties Of Claim 61 Over Narita*, herein above.

Therefore, since the "claims are directed to a narrow range, the reference teaches a broad range and there is evidence of unexpected results within the claimed narrow range...it may be reasonable to conclude that the narrow range is not disclosed with 'sufficient specificity' to constitute an anticipation of the claims," as stated in MPEP 2131.03.

2a. (A) Discussion of Probabilities of Selecting Ranges of Claim 64 from Broad Ranges of Narita:

Again, it is also believed that Narita is insufficiently specific because of the size of the broad ranges disclosed in comparison to the relatively narrow ranges recited in the independent claims of the present invention. These broad ranges are not believed to permit a person of ordinary skill in the art to "clearly envisage" the claimed invention. In this regard, Applicants wish to discuss herein below what is understood by the Applicants to be the probability of a chance selection of **all** of the preferred ranges as claimed in Claim 64 using the broad ranges disclosed in Narita as a basis.

It is submitted that the discussion of the probabilities of selecting ranges of Claim 64 from broad ranges of Narita apply in corresponding manner as discussed in connection with Claim 61 herein above.

In view of the above, it is respectfully submitted that the preferred ranges of all of the components of the present invention as claimed in Claim 64 would not be readily discerned or "clearly envisaged" using the broad ranges of Narita as a guide. It is respectfully submitted that Narita could not reasonably be considered to teach, suggest, disclose, or render obvious the present invention as claimed.

It is thus submitted that the very large ranges for the mentioned eight glass components of Narita cover a great number of different types of borosilicate glass.

2b. Applicants' Invention as claimed in Claim 64:

Applicants' Claim 64 states:

> "A glass comprising:
> a substantially alkali-free aluminoborosilicate glass;
> said glass having a coefficient of thermal expansion $\alpha_{20/300}$

of between $2.8 \times 10^{-6}/K$ and $3.8 \times 10^{-6}/K$;

said glass having the composition (in % by weight, based on oxide):

SiO_2	> 58 - 65
B_2O_3	> 6 - 11.5
Al_2O_3	> 14 - 25
MgO	4 - 8
CaO	0 - 8
SrO	2.6 - < 4
BaO	**0 - < 0.5**
with SrO + BaO	> 3
ZnO	0 - 2." (emphasis added)

It is submitted that Applicants' Claim 64 claims a **selection invention** of a selection of specific ranges for the specific components of the claimed glass. The ranges of the present invention include only a very small portion of the ranges of Narita. Therefore, Narita is a non-teaching reference. The specific characteristics of the present invention result only by selecting the very specific ranges of the specific components. Since there is nothing in Narita that would point to the specific ranges of the specific components of the present invention, it is further submitted that Applicants' selection invention is not obvious over the Narita reference.

Please note the following Table 2. Table 2 corresponds to Table 1 for which Table 1 a detailed explanation has been provided as to the calculation of the values that are shown in Table 1. It is submitted that Table 2 provides a summary analysis of the distinctions of Applicants' Claim 64 over the Narita reference.

Table 2 - Comparison Of Glass Of Narita And Glass Of Applicants' Claim 64

Component or Sum of Components	Narita's Ranges of Components	Overlap between Applicants' Ranges of Components and Narita's Ranges of Components	Ratio of Applicants' Ranges of Components to Narita's Ranges of Components	Running Probability
SiO_2	30%	7%	0.233	1 in 12
B_2O_3	15%	5.5%	0.366	1 in 12
Al_2O_3	19%	11%	0.5789	1 in 20
MgO	10%	4%	0.40	1 in 51
CaO	15%	8%	0.533	1 in 96
SrO	10%	1.4%	0.14	1 in 690
BaO	30%	0.5%	0.0166	1 in 41,667
ZnO	10%	2%	0.20	1 in 208,333
SrO + BaO	40%	1.5%	0.0375	1 in 5,555,555

Thus, for Claim 64, multiplication of all the ratios of Applicants' range of components vs. Narita's range of components reveals a result of 0.00000018 which corresponds to 0.000018% or 1.8×10^{-5}%.

The low percentage of 1.8×10^{-5}% is an extremely small percentage of the total range of possibilities as suggested in Narita. The reciprocal of 0.00000018 is 5,555,555. In other words, there are more than **5 million** other ranges covered by the Narita reference of the same scope as the ranges of the present invention. It would be virtually impossible for someone to be able to determine which of the 5 million ranges would be advantageous to cover so as to provide the invention of the present application. Still in other words, Applicants' claim covers only a $^{1}/_{5555555}$ probability of the ranges that are covered by the Narita reference.

Thus, it is not understood how the Narita reference can make Applicants' range obvious. It is submitted that the Narita reference is not applicable as a reference because of the minuscule factor of 1.8 x 10^{-7}.

It is submitted that the foregoing differences of Applicants' glass alone are sufficient to show the patentable distinction over the Narita reference.

As mentioned, there is no disclosure in Narita of the sum of SrO plus BaO being between 3 wt% and 4.5 wt%. The importance of a specific BaO content in Applicants' glass will again be discussed in further detail herein below.

It is clear from the foregoing comparison, that Applicants' invention is a selection invention of specific and well-defined ranges that are not obvious over the Narita reference. More specifically, Applicants' glass is claimed in terms of small ranges within the very wide ranges of Narita. The specific and well-defined ranges of

Applicants' glass from within Narita lead to surprising results as will be discussed in greater detail below.

Furthermore, please note, as claimed in Claim 64, Applicants' glass contains the specific range of from 0 % to 0.5 % by weight of BaO.

Table 1 of Narita shows five samples, samples a to e. The five samples, a-e, all show a BaO content of 6.0 wt%. The BaO content of 6.0 wt% is outside the BaO content of 0 wt% to 0.5 wt% claimed in Claim 64.

Table 2 of Narita shows six samples, samples e to e-5. The six samples variously show a BaO content of from 3.7 wt% to 4.1 wt%. The BaO content of from 3.7 wt% to 4.1 wt% is outside the BaO content of 0 wt% to 0.5 wt% claimed in Claim 64.

Table 3 of Narita shows five samples, samples 1 to 5. Samples 1 to 5 variously show a BaO content of from 6.0 wt% to 25.0 wt%. The BaO content of from 6.0 wt% to 25.0 wt% is outside the BaO content of 0 wt% to 0.5 wt% claimed in Claim 64.

Table 4 of Narita shows three samples, samples 6 to 8. Sample 6 has no BaO content. However, sample 6 has an MgO content of 9.5 wt% which is greater than the MgO content of 4 wt% to 8% of Claim 64. Samples 7 and 8 show a BaO content of 12.0 wt% and 4 wt%, respectively. The BaO content of 4.0 wt% or 12.0 wt% is outside the BaO content of 0 wt% to 0.5 wt% claimed in Claim 64.

Table 5 of Narita shows five samples, samples 9 to 13. The five samples variously show a BaO content of from 1.0 wt% to 6.0 wt%. The BaO content of from 1.0 wt% to 6.0 wt% is outside the BaO content of 0 wt% to 0.5 wt% claimed in Claim 64.

It is submitted that the glass art is an unpredictable art. Thus, any change in the composition of a glass could not predict the

outcome of that glass and thus the outcome would be unpredictable. Further, what may appear to be a predictable outcome regarding glass compositions is not predictable and any appearance of predictability in this case is based on the use of hindsight, which is improper in determining obviousness.

2b. Discussion of Distinctions of Properties of Claim 64 over Narita:

The glass claimed in Claim 64 has a "**coefficient of thermal expansion** $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K." (emphasis added.) The glass having a BaO content of from 0 % to 0.5 % by weight, and the other specific ranges of the other components in Claim 64 result in a low coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K, because the claimed glass composition provides for the network builders that enhance crystallization. In other words, the combination of the components claimed in Claim 64 is formulated in such a way as to produce a low coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K. This permits the glass to have an expansion behavior in the same range as both, amorphous silicon and polycrystalline silicon. Therefore amorphous silicon and polycrystalline silicon can be disposed on the substrate glass as claimed in Claim 64 and the shear between silicon coated on the claimed glass substrate and the glass substrate will be minimized. Furthermore, a low coefficient of thermal expansion as claimed in Claim 64 results in the glass having a high resistance against thermal shock and also having a high temperature strength retention, that is, the glass retains its strength upon being subjected to high temperatures.

The Narita reference, as understood, contains no indication that suggests that the glasses of Narita have a low coefficient of thermal

expansion of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K. Therefore, the Narita reference, as understood, does not suggest or make obvious the combination of the specific composition and the specific ranges and the low coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K of Claim 64.

It is submitted that the present invention is not obvious over the Narita reference based on the foregoing.

It is also submitted that hindsight has been used to reject the claims of the present invention. However the use of hindsight is improper in determining obviousness.

2c. Discussion of Dependent Claims 65-80 Dependent upon Claim 64:

It is submitted that the dependent Claims 65-80 are allowable based on their dependence from Claim 64. Claim 64 has been discussed in detail above. Since the combination of the limitations of Claim 64 is not shown or disclosed in Narita, it is submitted that Claims 65-80 are not made obvious, and Claims 65-80 should be allowed.

3. Discussion of Claim 61 in View of Peuchert:

3a. Peuchert Disclosure:

With reference to the Abstract, the cited Peuchert reference discloses:

"an alkali-free aluminoborosilicate comprising

50-70 wt% SiO_2,
0.5-15 wt% B_2O_3,
10-25 wt% Al_2O_3,
0-10 wt% MgO,
0-10 wt% CaO,
0-12 wt% SrO,
0-15 wt% BaO,
0-10 wt% ZnO,

0-5 wt% ZrO_2,
0-5 wt% TiO_2,
0-2 SnO_2, and
0.05-2 MoO_3."

It is submitted that Peuchert discloses very large ranges for eight of the components of the aluminoborosilicate glass, namely, 50-70 wt% for SiO_2, 0.5-15 wt% B_2O_3, for 10-25 wt% Al_2O_3, 0-10 wt% for MgO, 0-10 wt% for CaO, 0-12 wt% for SrO, 0-15 wt% for BaO, 0-10 wt% ZnO.

It is submitted that the very large ranges for the mentioned eight glass components of Peuchert cover a great number of different types of borosilicate glass.

3b. Applicants' Invention as Claimed in Claim 61:

Applicants' Claim 61 states:

"A glass comprising:
a substantially alkali-free aluminoborosilicate glass;
said glass having the composition (in % by weight, based on oxide):

SiO_2	> 58 - 65
B_2O_3	> 6 - 11.5
Al_2O_3	> 14 - 25
MgO	4 - 8
CaO	0 - 8
SrO	2.6 - < 4
BaO	**0 - < 0.5**
with SrO + BaO	> 3
ZnO	0.5 - 2;

said composition of said SiO_2, said B_2O_3, said Al_2O_3, said MgO, said CaO, said SrO, said BaO, said SrO + BaO, and said ZnO being selected to provide all of (i.), (ii.), (iii.), and (iv.), wherein (i.), (ii.), (iii.), and (iv.) comprise:

(i.) a coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8×10^{-6}/K and 3.8×10^{-6}/K;

(ii.) a glass transition temperature, T_g, of more than 713 degrees Celsius to maximize heat resistance of said glass;

(iii.) a temperature at a viscosity of 10^2 dPas of at most 1694 degrees Celsius; and

(iv.) a processing temperature, V_A, at a viscosity of 10^4 dPas of at most 1273 degrees Celsius." (emphasis added)

It is submitted that Applicants' Claim 61 claims a **selection invention** of a selection of specific ranges for the specific components of the claimed glass. The ranges of the present invention include only a portion of the ranges of Peuchert. Therefore, Peuchert is a non-teaching reference. The specific characteristics of the present invention result only by selecting the very specific ranges of the specific components. Since there is nothing in Peuchert that would point to the specific ranges of the specific components of the present invention, it is further submitted that Applicants' selection invention is not obvious over Peuchert.

It is further submitted that all 13 examples of Peuchert show a BaO content that is 0.5 wt% or greater. In contrast, Applicants' Claim 61 states a BaO content of from 0 wt% to less than 0.5 wt%, based on oxide.

In the following, the distinctions between the glass of Peuchert and the glass of Applicants' Claim 61 are summarized in Table 3 on the following page. It is submitted that the detailed analysis presented with respect to Claim 61 in connection with the Narita reference, above, applies in corresponding manner in the presentation in connection with Peuchert.

Table 3 - Comparison Of Glass Of Peuchert And Glass Of Applicants' Claim 61

Component or Sum of Components	Peuchert's Ranges of Components	Overlap between Applicants' Ranges of Components and Peuchert's Ranges of Components	Ratio of Applicants' Ranges of Components to Peuchert's Ranges of Components	Running Probability
SiO_2	20%	7%	0.35	1 in 7
B_2O_3	14.5%	5.5%	0.379	1 in 7
Al_2O_3	15%	11%	0.7333	1 in 10
MgO	10%	4%	0.40	1 in 26
CaO	12%	8%	0.666	1 in 38
SrO	12%	1.4%	0.1166	1 in 333
BaO	15%	0.5%	0.0333	1 in 10,101
ZnO	10%	1.5%	0.15	1 in 67,567
SrO + BaO	27%	1.5%	0.05	1 in 1,351,351

Multiplication of all the ratios of Applicants' range of components vs. Peuchert's range of components in Table 3 reveals a result of 0.00000074 which corresponds to 0.000074% or
$7.4 \times 10^{-5}\%$.

The low percentage of $7.4 \times 10^{-5}\%$ is an extremely small percentage of the total range of possibilities as suggested in Peuchert. The reciprocal of 0.00000074 is 1,351,351. In other words, there are over **1 million** other ranges covered by Peuchert of the same scope as the ranges of the present invention. It would be virtually impossible for someone to be able to determine which of the more than 1 million ranges would be advantageous to cover so as to provide the invention of the present application. Still in other words, Applicants' claim covers only a $^{1}/_{1351351}$ probability of the ranges that are covered by Peuchert.

Thus, it is not understood how Peuchert can make Applicants' ranges obvious. It is submitted that Peuchert is not applicable as a reference because of the minuscule factor of 7.4×10^{-7}.

It is submitted that the foregoing differences of Applicants' glass are sufficient to show the patentable distinction over Peuchert.

Furthermore, there is no disclosure in Peuchert that the sum of SrO plus BaO be greater than 3%. The importance of a specific BaO content in Applicants' glass has been discussed in Sections 1d. and 1e., above.

It is clear from the foregoing that Peuchert does not make obvious Applicants' Claim 61 and thus Applicants' Claim 61 should be allowed.

3c. Discussion of Dependent Claims 62 and 63 Dependent Upon Claim 61:

It is submitted that the dependent Claims 62 and 63 are

allowable based on their dependence upon Claim 61, having regard to the presentation made for Claim 61. Since the combination of the limitations of Claim 61 is not shown or disclosed in Peuchert, it is submitted that Claims 62 and 63, dependent upon Claim 61, are not made obvious, and Claims 62 and 63 should be allowed.

4. Discussion of Claim 64 in View of Peuchert:

Specifically, the Examiner stated:

"Claims 44-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peuchert et al., U.S. 6,417,124.

Peuchert et al. teach an alkali-free aluminoborosilicate comprising 50-70 wt% SiO_2, 0.5-15 wt% B_2O_3, 10-25 Al_2O_3, 0-10 wt% MgO, 0-10 wt% CaO, 0-12 wt% SrO, 0-15 wt% BaO, 0-10 wt% ZnO, 0-5 wt% ZrO_2, 0-5 wt% TiO_2, 0-2 SnO_2, and 0.05-2 MoO_3. See abstract of Peuchert et al. The reference teaches that the glass can be used as a substrate for thin film transistors, active matrix liquid crystal displays, and plasma addressed liquid crystals. See column 1. lines 6-11. The reference teaches that glasses for the above applications have high thermal shock resistance, high transparency over a broad spectral range (UV and VIS), and a density equal to or lower than 2.6 g/cm^3. See column 1, lines 11-16. The reference teaches that the glasses can be produced by the float glass method, which produces streak-free substrates with low surface undulations. See column 1, lines 25-30. The reference teaches that the glasses are free from As_2O_3 and Sb_2O_3. See column 5, lines 41-49. The reference teaches that the T_g is greater than 650 °C. See column 7, line 46. The reference further teaches that the thermal expansion coefficient is from 2.8x10^{-6}/K to 5.0x10^{-6}/K. See column 8, lines 43-44.

Peuchert et al. differ from the instant claims by not teaching specific examples that lie within the compositional ranges nor ranges of glass components which are sufficiently specific to anticipate the claim limitations. However, the compositional ranges of Peuchert et al. overlap the compositional ranges of claims 44-56. Overlapping ranges have been held to establish prima facie obviousness. See MPEP 2144.05.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected from the overlapping portion of the ranges of Peuchert et a1. because overlapping ranges have been held to establish

prima facie obviousness."

4a. Peuchert Disclosure:

With reference to the Abstract, the cited Peuchert discloses:

"an alkali-free aluminoborosilicate comprising

50-70 wt% SiO_2,
0.5-15 wt% B_2O_3,
10-25 wt% Al_2O_3,
0-10 wt% MgO,
0-10 wt% CaO,
0-12 wt% SrO,
0-15 wt% BaO,
0-10 wt% ZnO,
0-5 wt% ZrO_2,
0-5 wt% TiO_2,
0-2 SnO_2, and
0.05-2 MoO_3."

It is submitted that Peuchert discloses very large ranges for eight of the components of the aluminoborosilicate glass, namely, 50-70 wt% for SiO_2, 0.5-15 wt% B_2O_3, for 10-25 wt% Al_2O_3, 0-10 wt% for MgO, 0-10 wt% for CaO, 0-12 wt% for SrO, 0-15 wt% for BaO, 0-10 wt% ZnO.

It is submitted that the very large ranges for the mentioned eight glass components of Peuchert cover a great number of different types of borosilicate glass.

4b. Applicants' Invention as Claimed in Claim 64:

Applicants' Claim 64 states:

"A glass comprising:
a substantially alkali-free aluminoborosilicate glass;
said glass having a coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K;
said glass having the composition (in % by weight, based on oxide):

SiO_2	> 58 - 65
B_2O_3	> 6 - 11.5

Al_2O_3	> 14 - 25
MgO	4 - 8
CaO	0 - 8
SrO	2.6 - < 4
BaO	**0 - < 0.5**
with SrO + BaO	> 3
ZnO	0 - 2." (emphasis added)

It is again submitted that Applicants' Claim 64 claims a **selection invention** of a selection of specific ranges for the specific components of the claimed glass. The ranges of the present invention include only a portion of the ranges of Peuchert. Therefore, Peuchert is a non-teaching reference. The specific characteristics of the present invention result only by selecting the very specific ranges of the specific components. Since there is nothing in Peuchert that would point to the specific ranges of the specific components of the present invention, it is further submitted that Applicants' selection invention is not obvious over Peuchert.

It is further submitted that all 13 examples of Peuchert show a BaO content of 0.5 wt% or more. In contrast, Applicants' Claim 61 states a BaO content that is from 0 wt% to less than 0.5 wt%.

In the following, the distinctions between the glass of Peuchert and the glass of Applicants' Claim 64 are summarized in Table 4 on the following page. It is submitted that the detailed analysis presented with respect to Claim 61 in connection with the Narita reference, above, applies in corresponding manner in the presentation in connection with Peuchert.

Table 4 - Comparison Of Glass Of Peuchert And Glass Of Applicants' Claim 64

Component or Sum of Components	Peuchert's Ranges of Components	Overlap between Applicants' Ranges of Components and Peuchert's Ranges of Components	Ratio of Applicants' Ranges of Components to Peuchert's Ranges of Components	Running Probability
SiO_2	20%	7%	0.35	1 in 7
B_2O_3	14.5%	5.5%	0.379	1 in 7
Al_2O_3	15%	11%	0.7333	1 in 10
MgO	10%	4%	0.40	1 in 26
CaO	12%	8%	0.666	1 in 38
SrO	12%	1.4%	0.1166	1 in 333
BaO	15%	0.5%	0.0333	1 in 10,101
ZnO	10%	2%	0.2	1 in 50,505
SrO + BaO	27%	1.5%	0.05	1 in 1,010,101

Multiplication of all the ratios of Applicants' range of components vs. Peuchert's range of components in Table 4 reveals a result of 0.00000099 which corresponds to 0.000099 or $9.9 \times 10^{-5}\%$.

The low percentage of $9.9 \times 10^{-5}\%$ is an extremely small percentage of the total range of possibilities as suggested in Peuchert. The reciprocal of 0.00000099 is 1,010,101. In other words, there are over **<u>1 million</u>** other ranges covered by Peuchert of the same scope as the ranges of the present invention. It would be virtually impossible for someone to be able to determine which of the over 1 million ranges would be advantageous to cover so as to provide the invention of the present application. Still in other words, Applicants' claim covers only a $^{1}/_{1010101}$ probability of the ranges that are covered by Peuchert.

Thus, it is not understood how Peuchert can make Applicants' ranges obvious. It is submitted that Peuchert is not applicable as a reference because of the minuscule factor of 9.9×10^{-7}.

It is submitted that the foregoing differences of Applicants' glass are sufficient to show the patentable distinction over Peuchert.

Furthermore, there is no disclosure in Peuchert that the sum of SrO plus BaO be more than 3%. The importance of a specific BaO content in Applicants' glass has been discussed in Sections 1d. and 1e., above.

It is clear from the foregoing that Peuchert does not make obvious Applicants' Claim 64 and thus Applicants' Claim 64 should be allowed.

<u>4c. Discussion of Dependent Claims 65-80 Dependent Upon Claim 64:</u>

It is submitted that the dependent Claims 65-80 are allowable based on their dependence upon Claim 64, having regard to the

presentation made for Claim 64. Since the combination of the limitations of Claim 64 is not shown or disclosed in Peuchert. reference, it is submitted that Claims 65-80, dependent upon Claim 64, are not made obvious, and Claims 65-80 should be allowed.

5. Discussion of Claim 61 in View of Watzke:

5a. Watzke Disclosure:

With reference to the DERWENT Abstract, Watzke discloses:

"alkaline earth aluminoborosilicate glass consisting of

50-65 wt% SiO_2,
5-15 wt% B_2O_3,
10-20 wt% Al_2O_3,
0-10 wt% MgO,
0-20 wt% CaO,
0-20 wt% SrO,
0-20 wt% BaO,
0-10 wt% ZnO,
0.01-1 wt% SnO,
0.1-2 wt% ZrO_2,
0-10 La_2O_3,
0-10 wt% Nb_2O_5,
0-10 wt% Ta_2O_5 and
0-10 wt% TiO_2."

It is submitted that the Watzke reference discloses very large ranges for at least four of the components of the aluminoborosilicate glass, namely, 0-10 wt% for MgO, 0-20 wt% for CaO, 0-20 wt% for SrO, and 0-20 wt% for BaO.

It is submitted that at least the large ranges for the mentioned four glass components of the Watzke reference cover a great number of different types of borosilicate glass.

With reference to the example on page 3, lines 37-38, Watzke discloses:

"alkaline earth aluminoborosilicate glass consisting of

53-63 wt% SiO_2,

5-15 wt% B_2O_3,
12-20 wt% Al_2O_3,
0-5 wt% MgO,
2-10 wt% CaO,
0-10 wt% SrO, and
3-15 wt% BaO.

It is submitted that the Watzke reference discloses very large ranges for at least four of the components of the aluminoborosilicate glass, namely, 0-5 wt% for MgO, 2-10 wt% for CaO, 0-10 wt% for SrO, and 3-15 wt% for BaO.

It is submitted that at least the large ranges for the mentioned four glass components of the Watzke reference cover a great number of different types of borosilicate glass.

5b. Applicants' Invention as Claimed in Claim 61:

Applicants' Claim 61 states:

"A glass comprising:
a substantially alkali-free aluminoborosilicate glass;
said glass having the composition (in % by weight, based on oxide):

SiO_2	> 58 - 65
B_2O_3	> 6 - 11.5
Al_2O_3	> 14 - 25
MgO	4 - 8
CaO	0 - 8
SrO	2.6 - < 4
BaO	**0 - < 0.5**
with SrO + BaO	> 3
ZnO	0.5 - 2;

said composition of said SiO_2, said B_2O_3, said Al_2O_3, said MgO, said CaO, said SrO, said BaO, said SrO + BaO, and said ZnO being selected to provide all of (i.), (ii.), (iii.), and (iv.), wherein (i.), (ii.), (iii.), and (iv.) comprise:

(i.) a coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K;

(ii.) a glass transition temperature, T_g, of more than 713 degrees Celsius to maximize heat resistance of said glass;

(iii.) a temperature at a viscosity of 10^2 dPas of at

most 1694 degrees Celsius; and

(iv.) a processing temperature, V_A, at a viscosity of 10^4 dPas of at most 1273 degrees Celsius." (emphasis added)

It is submitted that Applicants' Claim 61 claims a **selection invention** of a selection of specific ranges for the specific components of the claimed glass. The ranges of the present invention include only a small portion of the ranges of the Watzke reference. Therefore, Watzke is a non-teaching reference. The specific characteristics of the present invention result only by selecting the very specific ranges of the specific components. Since there is nothing in the Watzke reference that would point to the specific ranges of the specific components of the present invention, it is further submitted that Applicants' selection invention is not obvious over the Watzke reference.

It is respectfully submitted that Claim 61, in contrast to the example of ranges of components on page 3, lines 37-38, Applicants' Claim 61 states a BaO content of from 0 wt% to less than 0.5 wt%. Watzke recites a BaO content of 3-15%. Therefore, the example on page 3, lines 37-38, does not teach the BaO content in the range of 0-0.5% as recited in Claim 61. Claim 61 is therefore believed to distinguish over the Watzke example on page 3.

In addition, Claim 61 sets forth an amount of ZnO of from 0.5 wt% to 2.0 wt%. In the example on page 3, lines 37-38, of Watzke, ZnO is not listed as one of the components, and thus it is believed that Claim 61 distinguishes over this example.

It is further submitted that all three examples of Watzke show a BaO content of 5.3 wt% or more. In contrast, Applicants' Claim 61 states a BaO content of from 0 wt% to less than 0.5 wt%.

In the following, the distinctions between the glass of the

Watzke according to the DERWENT Abstract and the glass of Applicants' Claim 61 are summarized in Table 5. It is submitted that the detailed analysis presented with respect to Claim 61 in connection with the Narita reference, above, applies in corresponding manner for the presentation in connection with the Watzke reference.

Please note that Watzke presents some ranges that overlap with the ranges of Claim 61. For example, in the abstract of Watzke the Al_2O_3 content is 10-20%. In Claim 61, the Al_2O_3 is 14-25%. The overlap between the Al_2O_3 range of Watzke and the Al_2O_3 range of Claim 61 is therefore 14-20%, for a range of 6%. This formula was used to calculate the results shown in the subsequent Table 5.

Table 6 - Comparison Of Glass Of Watzke (Ranges in Abstract) And Glass Of Applicants' Claim 64

Component or Sum of Components	Watzke's Ranges of Components	Overlap between Applicants' Ranges of Components and Watzke's Ranges of Components	Ratio of Applicants' Ranges of Components to Watzke's Ranges of Components	Running Probability
SiO_2	15%	7%	0.466	1 in 4
B_2O_3	10%	5.5%	0.55	1 in 4
Al_2O_3	10%	6%	0.60	1 in 6.5
MgO	10%	4%	0.40	1 in 16
CaO	20%	8%	0.40	1 in 40
SrO	20%	1.4%	0.07	1 in 571
BaO	20%	0.5%	0.025	1 in 22,883
ZnO	10%	2%	0.2	1 in 114,416
SrO + BaO	40%	1.5%	0.0375	1 in 3,051,106

Multiplication of all the ratios of Applicants' range of components vs. Watzke's Abstract range of components in Table 5 reveals a result of 0.000000245 which corresponds to 0.0000245% or
2.45×10^{-5}%.

The low percentage of 2.45×10^{-5}% is an extremely small percentage of the total range of possibilities as suggested in the Watzke Abstract. The reciprocal of 0.000000245 is 4,071,246. In other words, there are over **4 million** other ranges covered by the Watzke Abstract of the same scope as the ranges of the present invention. It would be virtually impossible for someone to be able to determine which of the over 4 million ranges would be advantageous to cover so as to provide the invention of the present application. Still in other words, Applicants' claim covers only a $^{1}/_{4071246}$ probability of the ranges that are covered by the Watzke Abstract.

Thus, it is not understood how the Watzke reference can make Applicants' ranges obvious. It is submitted that the Watzke reference is not applicable as a reference because of the minuscule factor of 2.45×10^{-7}.

Furthermore, there is no disclosure in the Watzke reference of the sum of SrO plus BaO being more than 3%. The importance of a specific BaO content in Applicants' glass has been discussed in Sections 1d. and 1e., above.

It is clear from the foregoing that the Watzke reference does not make obvious Applicants' Claim 61 and thus Applicants' Claim 61 should be allowed.

5c. Discussion of Dependent Claims 62 and 63 Dependent Upon Claim 61:

It is submitted that the dependent Claims 62 and 63 are allowable based on their dependence upon Claim 61, having regard to

the presentation made for Claim 61. Since the combination of the limitations of Claim 61 is not shown or disclosed in the Watzke reference, it is submitted that Claims 62 and 63, dependent upon Claim 61, are not made obvious, and Claims 62 and 63 should be allowed.

6. Discussion of Claim 64 In View Of Watzke:

Specifically, the Examiner stated:

"Claims 44-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watzke, German Patent DE 19601922 A1.

Watzke teaches an alkaline earth aluminoborosilicate glass consisting of 50-65 wt% SiO_2, 5-15 wt% B_2O_3,10-20 Al_2O_3, 0-10 wt% MgO, 0-20 wt% CaO, 0-20 wt% SrO, 0-20 wt% BaO, 0-10 wt% ZnO, 0.01-1 wt% SnO, 0.1-2 wt% ZrO_2, 0-10 La_2O_3, 0-10 wt% Nb_2O_5, 0-10 wt% Ta_2O_5 and 0-10 wt% TiO_2. See the Derwent Abstract of Watzke. More specifically, Watzke teaches the compositional ranges are 53-63 wt% SiO_2, 5-15 wt% B_2O_3, 12-20 Al_2O_3, 0-5 wt% MgO, 2-10 wt% CaO, 0-10 wt% SrO, 3-15 wt% BaO, 0.01-1 wt% SnO, and 0.1-1 wt% ZrO_2. See page 3, lines 37-38 of DE 19,601,922. Watzke teaches that glass can be used as a substrate for display technologies or as thin layer solar cells. See the Derwent Abstract, use paragraph.

Watzke differs from the instant claims by not teaching specific examples that lie within the compositional ranges nor ranges of glass components which are sufficiently specific to anticipate the claim limitations. However, the compositional ranges of Watzke overlap the compositional ranges of claims 44-56. Overlapping ranges have been held to establish prima facie obviousness. See MPEP 2144.05.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected from the overlapping portion of the ranges of Watzke because overlapping ranges have been held to establish prima facie obviousness.

One of ordinary skill in the art would expect that glasses with overlapping compositional ranges would have overlapping ranges of properties as recited in claims 44-48, 55, and 56."

6a. Watzk Disclosur :

With reference to the DERWENT Abstract, Watzke discloses:

"alkaline earth aluminoborosilicate glass consisting of

50-65 wt% SiO_2,
5-15 wt% B_2O_3,
10-20 wt% Al_2O_3,
0-10 wt% MgO,
0-20 wt% CaO,
0-20 wt% SrO,
0-20 wt% BaO,
0-10 wt% ZnO,
0.01-1 wt% SnO,
0.1-2 wt% ZrO_2,
0-10 La_2O_3,
0-10 wt% Nb_2O_5,
0-10 wt% Ta_2O_5 and
0-10 wt% TiO_2.

It is submitted that the Watzke reference discloses very large ranges for at least four of the components of the aluminoborosilicate glass, namely, 0-10 wt% for MgO, 0-20 wt% for CaO, 0-20 wt% for SrO, and 0-20 wt% for BaO.

It is submitted that at least the large ranges for the mentioned four glass components of the Watzke reference cover a great number of different types of borosilicate glass.

With reference to the example on page 3, lines 37-38, Watzke discloses:

"alkaline earth aluminoborosilicate glass consisting of

53-63 wt% SiO_2,
5-15 wt% B_2O_3,
12-20 wt% Al_2O_3,
0-5 wt% MgO,
2-10 wt% CaO,
0-10 wt% SrO, and
3-15 wt% BaO.

It is submitted that the Watzke reference discloses very large

ranges for at least four of the components of the aluminoborosilicate glass, namely, 0-5 wt% for MgO, 2-10 wt% for CaO, 0-10 wt% for SrO, and 3-15 wt% for BaO.

It is submitted that at least the large ranges for the mentioned four glass components of the Watzke reference cover a great number of different types of borosilicate glass.

6b. Applicants Invention as Claimed in Claim 64:

Applicants' Claim 64, states:

"A glass comprising:
a substantially alkali-free aluminoborosilicate glass;
said glass having a coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K;
said glass having the composition (in % by weight, based on oxide):

SiO_2	> 58 - 65
B_2O_3	> 6 - 11.5
Al_2O_3	> 14 - 25
MgO	4 - 8
CaO	0 - 8
SrO	2.6 - < 4
BaO	**0 - < 0.5**
with SrO + BaO	> 3
ZnO	0 - 2." (emphasis added)

It is submitted that Applicants' Claim 64 claims a **selection invention** of a selection of specific ranges for the specific components of the claimed glass. The ranges of the present invention include only a portion of the ranges of the Watzke reference. Therefore, Watzke is a non-teaching reference. The specific characteristics of the present invention result only by selecting the very specific ranges of the specific components. Since there is nothing in the Watzke reference that would point to the specific ranges of the specific components of the present invention, it is further submitted that Applicants' selection invention is not obvious

over the Watzke reference.

It is respectfully submitted that Claim 64, in contrast to the example of ranges of components on page 3, lines 37-38, Applicants' Claim 64 states a BaO content of from 0 wt% to less than 0.5 wt%. Watzke recites a BaO content of 3-15%. Therefore, the example on page 3, lines 37-38, does not teach the BaO content in the range of 0-0.5% as recited in Claim 64. Claim 64 is therefore believed to distinguish over the Watzke example on page 3.

In addition, Claim 64 sets forth an amount of from 0 wt% to 2.0 wt% of ZnO. In the example on page 3, lines 37-38, of Watzke, ZnO is not listed as one of the components, and thus it is believed that Claim 64 distinguishes over this example.

It is further submitted that all three examples of Watzke show a BaO content of more than 5.3 wt%. In contrast, Applicants' Claim 64 states a BaO content of from 0 wt% to less than 0.5 wt%.

In the following, the distinctions between the glass of the Watzke according to the DERWENT Abstract and the glass of Applicants' Claim 64 are summarized in Table 6. It is submitted that the detailed analysis presented with respect to Claim 61 in connection with the Narita reference, above, applies in corresponding manner for the presentation in connection with the Watzke reference.

Please note that Watzke presents some ranges that overlap with the ranges of Claim 64. For example, in the abstract of Watzke the Al_2O_3 content is 10-20%. In Claim 64, the Al_2O_3 is 14-25%. The overlap between the Al_2O_3 range of Watzke and the Al_2O_3 range of Claim 64 is therefore 14-20%, for a range of 6%. This formula was used to calculate the results shown in the subsequent Table 6.

Table 6 - Comparison Of Glass Of Watzke (Ranges in Abstract) And Glass Of Applicants' Claim 64

Component or Sum of Components	Watzke's Ranges of Components	Overlap between Applicants' Ranges of Components and Watzke's Ranges of Components	Ratio of Applicants' Ranges of Components to Watzke's Ranges of Components	Running Probability
SiO_2	15%	7%	0.466	1 in 4
B_2O_3	10%	5.5%	0.55	1 in 4
Al_2O_3	10%	6%	0.60	1 in 6.5
MgO	10%	4%	0.40	1 in 16
CaO	20%	8%	0.40	1 in 40
SrO	20%	1.4%	0.07	1 in 571
BaO	20%	0.5%	0.025	1 in 22,883
ZnO	10%	2%	0.2	1 in 114,416
SrO + BaO	40%	1.5%	0.0375	1 in 3,051,106

Multiplication of all the ratios of Applicants' range of components vs. Watzke's Abstract range of components in Table 6 reveals a result of 0.000000327 which corresponds to 0.0000327% or
$3.27 \times 10^{-5}\%$.

The low percentage of $3.27 \times 10^{-5}\%$ is an extremely small percentage of the total range of possibilities as suggested in the Watzke Abstract. The reciprocal of 0.000000327 is 3,051,106. In other words, there are over **3 million** other ranges covered by the Watzke Abstract of the same scope as the ranges of the present invention. It would be virtually impossible for someone to be able to determine which of the over 3 million ranges would be advantageous to cover so as to provide the invention of the present application. Still in other words, Applicants' claim covers only a $^{1}/_{3051106}$ probability of the ranges that are covered by the Watzke Abstract.

Thus, it is not understood how the Watzke reference can make Applicants' ranges obvious. It is submitted that the Watzke reference is not applicable as a reference because of the minuscule factor of 3.27×10^{-7}.

Thus, it is not understood how the Watzke reference can make Applicants' ranges obvious.

Furthermore, there is no disclosure in the Watzke reference of the sum of SrO plus BaO being greater than 3%. The importance of a specific BaO content in Applicants' glass has been discussed in Sections 1d. and 1e., above.

It is clear from the foregoing that the Watzke reference does not make obvious Applicants' Claim 64 and thus Applicants' Claim 64 should be allowed.

6c. Discussion of Dependent Claims 65-80 Dependent Upon Claim 64:

It is submitted that the dependent Claims 65-80 are allowable based on their dependence upon Claim 64, having regard to the presentation made for Claim 64. Since the combination of the limitations of Claim 64 is not shown or disclosed in the Watzke reference, it is submitted that Claims 65-80, dependent upon Claim 64, are not made obvious, and Claims 65-80 should be allowed.

7. Discussion of Claim 61 in View of Lautenschläger:

7a. Lautenschläger Disclosure:

With reference to the Abstract, Lautenschläger discloses:

"alkali-free glass consisting of
>60-65 wt% SiO_2,
6.5-9.5 wt% B_2O_3,
14-21 wt% Al_2O_3,
1-8 wt% MgO,
1-6 wt% CaO,
1-9 wt% SrO,
0.1-3.5 wt% BaO,
0.1-1.5 wt% ZrO_2,
0.1-1 wt% SnO_2,
0.1-1 TiO_2 and
0.001-1 wt% CeO_2."

Lautenschläger, as understood, shows a glass for use as a substrate glass in display technology. Lautenschläger shows two tables, Tables 1 and 2, with a total of 25 examples of glass compositions (in Table 1, examples 1 to 12, and in Table 2, examples A to I). The glass components are expressed in terms of parts by weight on the oxide basis. None of the 25 examples shows any zinc oxide content for the glass compositions. Moreover, nothing in the abstract or the specification of Lautenschläger shows any zinc oxide content for the Lautenschläger glass compositions.

7b. Applicants' Invention as Claimed in Claim 61:

In contrast to Lautenschläger, newly presented Claim 61 states:

"A glass comprising:

a substantially alkali-free aluminoborosilicate glass;

said glass having the composition (in % by weight, based on oxide):

SiO_2	> 58 - 65
B_2O_3	> 6 - 11.5
Al_2O_3	> 14 - 25
MgO	4 - 8
CaO	0 - 8
SrO	2.6 - < 4
BaO	0 - < 0.5
with SrO + BaO	> 3
ZnO	**0.5 - 2;**

said composition of said SiO_2, said B_2O_3, said Al_2O_3, said MgO, said CaO, said SrO, said BaO, said SrO + BaO, and said ZnO being chosen to provide all of (i.), (ii.), (iii.), and (iv.), wherein (i.), (ii.), (iii.), and (iv.) comprise:

(i.) a coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8×10^{-6}/K and 3.8×10^{-6}/K;

(ii.) a glass transition temperature, T_g, of more than 713 degrees Celsius to maximize heat resistance of said glass;

(iii.) a temperature at a viscosity of 10^2 dPas of at most 1694 degrees Celsius; and

(iv.) a processing temperature, V_A, at a viscosity of 10^4 dPas of at most 1273 degrees Celsius." (emphasis added)

In contrast to Lautenschläger, newly presented Claim 61 claims a zinc oxide content of from 0.5 wt% to 2.0 wt%. This amount of zinc oxide of from 0.5 wt% to 2.0 wt% serves as network modifier for the claimed glasses. In other words, it is believed that the zinc oxide modifies the stiff, viscous backbone structure which backbone structure comprises the main components of a glass. At the transformation temperature, most network modifier atoms are ionized, and atoms such as sodium, lithium, and potassium are able to diffuse throughout the glass matrix with little resistance.

It is therefore respectfully submitted that Claim 61 distinguishes

over and is not made obvious by Lautenschläger because Lautenschläger does not teach or suggest the use of zinc oxide.

7b. (A) Discussion of Further Distinctions f Claim 61 over Lautenschläger:

With reference to the 25 examples of Lautenschläger, example 1 in Table 1 of Lautenschläger, shows an amount of MgO of 4 wt%. The amount of 4 wt% is within the claimed range of 4 wt% to 8 wt% of MgO. However, example 1 of Table 1 of Lautenschläger shows an amount of 6 wt% of SrO. The amount of 6 wt% is outside of the claimed range of 2.6 wt% to 4 wt% of SrO.

Examples 2 to 6 in Table 1 of Lautenschläger, show an amount variously of 2 wt% and 3 wt% of MgO. The amounts of 2 wt% and 3 wt% of MgO are outside of the claimed range of 4 wt% to 8 wt% of MgO.

Example 7 in Table 1 of Lautenschläger shows an amount of 4 wt% of MgO. The amount of 4 wt% of MgO is within the claimed range of 4 wt% to 8 wt% of MgO. However, example 7, of Table 1 of Lautenschläger shows an amount of 4.5 wt% of SrO. The amount of 4.5 wt% of SrO is outside of the claimed range of 2.6 wt% to 4 wt% of SrO.

Example 8 to 12 in Table 1 of Lautenschläger, show an amount variously of 2 wt% and 3 wt% of MgO. The amounts of 2 wt% and 3 wt% of MgO are outside of the claimed range of 4 wt% to 8 wt% of MgO.

Example A in Table 2 of Lautenschläger shows an amount of 8 wt% of MgO. The amount of 8 wt% of MgO is within the claimed range of 4 wt% to 8 wt% of MgO. However, example A of Table 2 of Lautenschläger shows an amount of 5.0 wt% of B_2O_3. The amount of 5.0 wt% of B_2O_3 is outside of the claimed range of from more than 6

wt% to 11.5 wt% of B_2O_3.

Example B in Table 2 of Lautenschläger shows an amount of 5 wt% of MgO. The amount of 5 wt% of MgO is within the claimed range of 4 wt% to 8 wt% of MgO. However, example B of Table 2 of Lautenschläger shows an amount of 2.0 wt% of BaO. The amount of 2.0 wt% of BaO is outside of the claimed range of from 0 wt% to less than 0.5 wt% of BaO.

Example C in Table 2 of Lautenschläger shows an amount of 2 wt% of MgO. The amount of 2 wt% of MgO is outside of the claimed range of 4 wt% to 8 wt% of MgO.

Example D in Table 2 of Lautenschläger shows an amount of 10 wt% of MgO. The amount of 10 wt% of MgO is outside the claimed range of 4 wt% to 8 wt% of MgO.

Example E in Table 2 of Lautenschläger shows an amount of 5 wt% of MgO. The amount of 5 wt% of MgO is within the claimed range of 4 wt% to 8 wt% of MgO. However, example E of Table 2 of Lautenschläger shows an amount of 5.0 wt% of B_2O_3. The amount of 5.0 wt% of B_2O_3 is outside of the claimed range of from more than 6 wt% to 11.5 wt% of B_2O_3.

Example F in Table 2 of Lautenschläger shows an amount of 5 wt% of MgO. The amount of 5 wt% of MgO is within the claimed range of 4 wt% to 8 wt% of MgO. However, example F of Table 2 of Lautenschläger shows an amount of 5.0 wt% of B_2O_3. The amount of 5.0 wt% of B_2O_3 is outside of the claimed range of from more than 6 wt% to 11.5 wt% of B_2O_3.

Example G in Table 2 of Lautenschläger shows an amount of 6 wt% of MgO. The amount of 6 wt% of MgO is within the claimed range of 4 wt% to 8 wt% of MgO. However, example G of Table 2 of Lautenschläger shows an amount of 5.0 wt% of B_2O_3. The amount of

5.0 wt% of B_2O_3 is outside of the claimed range of from more than 6 wt% to 11.5 wt% of B_2O_3.

Example H in Table 2 of Lautenschläger shows an amount of 6 wt% of MgO. The amount of 6 wt% of MgO is within the claimed range of 4 wt% to 8 wt% of MgO. However, example H of Table 2 of Lautenschläger shows an amount of 4.0 wt% of B_2O_3. The amount of 4.0 wt% of B_2O_3 is outside of the claimed range of from more than 6 wt% to 11.5 wt% of B_2O_3.

Example I in Table 2 of Lautenschläger shows an amount of 2 wt% of MgO. The amount of 2 wt% of MgO is outside the claimed range of 4 wt% to 8 wt% of MgO.

Even though Lautenschläger shows ranges in the Abstract, none of the 25 examples of Lautenschläger fall within the ranges of Claim 61. It is obvious that the compilation of 25 examples in Lautenschläger is far removed from Applicants' invention. Therefore, Lautenschläger does not teach or suggest the specific ranges of compositions of the claimed glasses.

It is again submitted that the glass art is an unpredictable art. Thus, any change in the composition of a glass could not predict the outcome of that glass and thus the outcome would be unpredictable. Further, what may appear to be a predictable outcome regarding glass compositions is not predictable and any appearance of predictability in this case is based on the use of hindsight, which is improper in determining obviousness.

It is also submitted that Lautenschläger only relates to glasses that contain ZrO_2, SnO_2, TiO_2, and CeO_2. The glasses have to contain all four alkaline earth metal oxides which is not a requirement in the claimed invention.

It is submitted that Applicants' Claim 61 claims a **s lection**

invention of a selection of specific ranges for the specific components of the claimed glass. The specific characteristics of the present invention result only by selecting the very specific ranges of the specific components of Claim 61. Since there is nothing in Lautenschläger that would point to the specific ranges of the specific components of the present invention, it is submitted that Applicants' selection invention is not obvious over Lautenschläger.

7c. Discussion of Dependent Claims 62 and 63 Dependent Upon Claim 61:

It is submitted that the dependent Claims 62 and 63 are allowable based on their dependence upon Claim 61, having regard to the presentation made for Claim 61. Since the combination of the limitations of Claim 61 is not shown or disclosed in Lautenschläger, it is submitted that Claims 62 and 63, dependent upon Claim 61, are not made obvious, and Claims 62 and 63 should be allowed.

8. Discussion of Claim 64 in View of Lautenschläger:

Specifically, the Examiner stated:

> "Lautenschläger et al. teach an alkali-free glass consisting of >60-65 wt% SiO_2, 6.5-9.5 wt% B_2O_3, 14-21 wt% Al_2O_3, 1-8 wt% MgO, 1-6 wt% CaO, 1-9 wt% SrO, 0.1-3.5 wt% BaO, 0.1-1.5 wt% ZrO_2, 0.1-1 wt% SnO_2, 0.1-1 TiO_2 and 0.001-1 wt% CeO_2. See abstract of Lautenschläger et al. Lautenschläger et al. teach that glass can be used as a substrate for display technologies. See Abstract of Lautenschläger et al. The reference teaches that the glasses used for display technologies have the following properties: coefficient of thermal expansion from 3.0 to 3.8×10^{-6}/K, T_g from 710-780 °C, a density less than or equal to 2.5 g/cm^3, and free from visual defects such as inclusions, knots, and bubbles. See column 1, lines 35-67. Lautenschläger et al. teach that the glass can be produced with the above mentioned properties by the float glass or draw methods. See column 4, lines 41-52. The reference further teaches that As_2O_3 and Sb_2O_3 should not be contained in glasses produced in the float method but may be used in nonreducing conditions such as downdraw method. See column 7,

lines 25-36.

Lautenschläger et al. differ from the instant claims by not teaching specific examples that lie within the compositional ranges nor ranges of glass components which are sufficiently specific to anticipate the claim limitations. However, the compositional ranges of Lautenschläger et al. overlap the compositional ranges of claims 17-29. Overlapping ranges have been held to establish prima facie obviousness. See MPEP 2144.05.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected from the overlapping portion of the ranges of Lautenschläger et al. because overlapping ranges have been held to establish prima facie obviousness."

8a. Lautenschläger Disclosure:

With reference to the Abstract, Lautenschläger discloses:

> "alkali-free glass consisting of
> >60-65 wt% SiO_2,
> 6.5-9.5 wt% B_2O_3,
> 14-21 wt% Al_2O_3,
> 1-8 wt% MgO,
> 1-6 wt% CaO,
> 1-9 wt% SrO,
> 0.1-3.5 wt% BaO,
> 0.1-1.5 wt% ZrO_2,
> 0.1-1 wt% SnO_2,
> 0.1-1 TiO_2 and
> 0.001-1 wt% CeO_2."

Lautenschläger, as understood, shows a glass for use as a substrate glass in display technology. Lautenschläger shows two tables, Tables 1 and 2, with a total of 25 examples of glass compositions (in Table 1, examples 1 to 12, and in Table 2, examples A to I). The glass components are expressed in terms of parts by weight on the oxide basis. None of the 25 examples shows any zinc oxide content for the glass compositions. Moreover, nothing in the abstract or the specification of Lautenschläger shows any zinc oxide

content for the Lautenschläger glass compositions.

8b. Applicants' Invention as Claimed in Claim 64:

In contrast to Lautenschläger, Applicants' Claim 64 states:

"A glass comprising:
a substantially alkali-free aluminoborosilicate glass;
said glass having a coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K;
said glass having the composition (in % by weight, based on oxide):

SiO_2	> 58 - 65
B_2O_3	> 6 - 11.5
Al_2O_3	> 14 - 25
MgO	4 - 8
CaO	0 - 8
SrO	2.6 - < 4
BaO	0 - < 0.5
with SrO + BaO	> 3
ZnO	0 - 2."

It is submitted that Applicants' Claim 64 claims a **selection invention** of a selection of specific ranges for the specific components of the claimed glass. The specific characteristics of the present invention result only by selecting the very specific ranges of the specific components. Since there is nothing in Lautenschläger reference that would point to the specific ranges of the specific components of the present invention, it is further submitted that Applicants' selection invention is not obvious over Lautenschläger.

It is further submitted that Lautenschläger provides only a **1 in 646** probability of the same ranges being selected for the claimed glasses in view of Lautenschläger, see Table 7, following.

Table 7 - Comparison Of Glass Of Lautenschläger And Applicants' Claim 64

Component or Sum of Components	Lautenschläger's Ranges of Components	Overlap between Applicants' Ranges of Components and Lautenschläger's Ranges of Components	Ratio of Applicants' Ranges of Components to Lautenschläger's Ranges of Components	Running Probability
SiO_2	5%	5%	1.0	1 in 1
B_2O_3	3%	3%	1.0	1 in 1
Al_2O_3	7%	7%	1.0	1 in 1
MgO	7%	4%	0.57	1 in 2
CaO	5%	5%	1.0	1 in 2
SrO	8%	1.4%	0.175	1 in 10
BaO	3.4%	0.4%	0.1176	1 in 86
SrO + BaO	11.4%	1.5%	0.32	1 in 646

It is clear from the foregoing that Lautenschläger does not make obvious Applicants' Claim 64 and thus Applicants' Claim 64 should be allowed.

8c. Discussion of Dependent Claims 65-80 Dependent Upon Claim 64:

It is submitted that the dependent Claims 65-80 are allowable based on their dependence upon Claim 64, having regard to the presentation made for Claim 64. Since the combination of the limitations of Claim 64 is not shown or disclosed in Lautenschläger, it is submitted that Claims 65-80, dependent upon Claim 64, are not made obvious, and Claims 65-80 should be allowed.

9. Discussion of Claim 61 in View of Nishizawa:

9a. Nishizawa Disclosure:

With reference to the Abstract, Nishizawa discloses:

> "an alkali-free glass consisting of
> 58.4-66 wt% SiO_2,
> 5-12 wt% B_2O_3,
> 15.3-22 Al_2O_3,
> 0-8 wt% MgO,
> 0-9 wt% CaO,
> 3-12.5 wt% SrO, and
> 0-<2 wt% BaO."

Nishizawa, as understood, shows a glass for use as a substrate glass for various displays. Nishizawa shows eleven tables, Tables 1 to 11, with a total of 46 examples of glass compositions. The glass components are expressed in terms of parts by weight on the oxide basis. None of the 64 examples shows any zinc oxide content for the glass compositions.

There is only a brief reference to ZnO in the disclosure of Nishizawa, in column **4**, lines 30-44, as follows:

> "In the glass of the present invention, in addition to the above components, ZnO may be incorporated in a total amount

of at most **5 mol %,** in order to improve the melting property, the clarity and the forming property of the glass." (emphasis added)

It can be seen that Nishizawa only briefly refers to ZnO and ZnO is mentioned in conjunction with SO_3, F, Cl, and SnO_2, with all five components together to total at most 5 mol %.

9b. Applicants' Invention as Claimed in Claim 61:

In contrast to Nishizawa, newly presented Claim 61 states:

"A glass comprising:
a substantially alkali-free aluminoborosilicate glass;
said glass having the composition (in % by weight, based on oxide):

SiO_2	> 58 - 65
B_2O_3	> 6 - 11.5
Al_2O_3	> 14 - 25
MgO	4 - 8
CaO	0 - 8
SrO	2.6 - < 4
BaO	0 - < 0.5
with SrO + BaO	> 3
ZnO	**0.5 - 2;**

said composition of said SiO_2, said B_2O_3, said Al_2O_3, said MgO, said CaO, said SrO, said BaO, said SrO + BaO, and said ZnO being chosen to provide all of (i.), (ii.), (iii.), and (iv.), wherein (i.), (ii.), (iii.), and (iv.) comprise:

(i.) a coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8 x 10^{-6}/K and 3.8 x 10^{-6}/K;

(ii.) a glass transition temperature, T_g, of more than 713 degrees Celsius to maximize heat resistance of said glass;

(iii.) a temperature at a viscosity of 10^2 dPas of at most 1694 degrees Celsius; and

(iv.) a processing temperature, V_A, at a viscosity of 10^4 dPas of at most 1273 degrees Celsius." (emphasis added)

In contrast to Nishizawa, newly presented Claim 61 claims a zinc oxide content of from 0.5 wt% to 2.0 wt%. This amount of zinc oxide of from 0.5 wt% to 2.0 wt% serves as network modifier for the claimed glasses. In other words, it is believed that the zinc oxide

modifies the stiff, viscous backbone structure which backbone structure comprises the main components of a glass. At the transformation temperature, most network modifier atoms are ionized, and atoms such as sodium, lithium, and potassium are able to diffuse throughout the glass matrix with little resistance.

It is therefore respectfully submitted that Claim 61 distinguishes over and is not made obvious by Nishizawa because Nishizawa does not teach or suggest the use of zinc oxide.

9., (A) Discussion of Further Distinctions of Claim 61 Over Nishizawa:

With reference to the 46 examples of Nishizawa, examples 1 to 3 in Table 1 of Nishizawa, variously show an amount of MgO of from 0 wt% to 1.2 wt%. An amount of from 0 wt% to 1.2 wt% is outside of the range of 4 wt% to 8 wt% of MgO claimed in Claim 61.

Example 4 in Table 1 of Nishizawa shows an amount of 3.1 wt% of MgO. The amount of 3.1 wt% of MgO is inside the range of 4 wt% to 8 wt% of MgO claimed in Claim 61. However, the example 4 shows a B_2O_3 content of 15.6 wt% which is outside the range of from more than 6 wt% to 11.5 wt% of B_2O_3 claimed in Claim 61.

Examples 5 to 9 in Table 1 of Nishizawa variously show an amount of from 0 wt% to 2.4 wt% of MgO. An amount of from 0 wt% to 2.4 wt% of MgO is outside the range of 4 wt% to 8 wt% of MgO claimed in Claim 61.

Examples 10 to 18 in Table 2 of Nishizawa variously show an amount of from 0 wt% to 2.6 wt% of MgO. An amounts of from 0 wt% to 2.6 wt% of MgO is outside the range of 4 wt% to 8 wt% of MgO claimed in Claim 61.

Examples 19 to 22 in Table 3 of Nishizawa et al. variously show an amount of from 0.6 wt% to 3.6 wt% of MgO. An amount of from

0.6 wt% to 3.6 wt% of MgO is outside the range of 4 wt% to 8 wt% of MgO claimed in Claim 61.

Example 23 in Table 3 of Nishizawa shows an amount of 4.2 wt% of MgO. The amount of 4.2 wt% of MgO is within the claimed range of 4 wt% to 8 wt% of MgO. However, example 23 shows an amount of 6.2 wt% of SrO. The amount of 6.2 wt% of SrO is outside of the claimed range of from 2.6 wt% to less than 4 wt% of SrO.

Example 24 in Table 3 of Nishizawa shows an amount of 5.0 wt% of MgO. The amount of 5.0 wt% of MgO is inside the claimed range of 4 wt% to 8 wt% of MgO. However, example 24 shows an amount of 6.4 wt% of SrO. The amount of 6.4 wt% of SrO is outside of the claimed range of from 2.6 wt% to less than 4 wt% of SrO.

Example 25 in Table 3 of Nishizawa shows an amount of 5.6 wt% of MgO. The amount of 5.6 wt% of MgO is inside the claimed range of 4 wt% to 8 wt% of MgO. However, example 25 shows an amount of 4.8 wt% of SrO. The amount of 4.8 wt% of SrO is outside of the claimed range of from 2.6 wt% to less than 4 wt% of SrO.

Example 26 in Table 3 of Nishizawa shows an amount of 6.2 wt% of MgO. The amount of 6.2 wt% of MgO is within the claimed range of 4 wt% to 8 wt% of MgO. However, example 26 shows an amount of 6.3 wt% of SrO. The amount of 6.3 wt% of SrO is outside of the claimed range of from 2.6 wt% to less than 4 wt% of SrO.

Example 27 in Table 3 of Nishizawa shows an amount of 3.9 wt% of MgO. The amount of 3.9 wt% of MgO is outside the claimed range of 4 wt% to 8 wt% of MgO.

Examples 28 and 29 in Table 4 of Nishizawa respectively show amounts of 3.7 wt% and 1.8 wt% of MgO. The amounts of 3.7 wt% and 1.8 wt% of MgO are outside the range of 4 wt% to 8 wt% of MgO claimed in Claim 61.

Examples 30 and 31 in Table 4 of Nishizawa will be discussed in greater detail herein below.

Example 32 in Table 4 of Nishizawa shows 4.3 wt% of MgO. The amount of 4.3 wt% of MgO is inside the range of 4 wt% to 8 wt% of MgO claimed in Claim 61. However, example 32 shows an amount of 11 wt% of SrO. The amount of 11 wt% of SrO is outside the range of from 2.6 wt% to less than 4 wt% of SrO claimed in Claim 61.

Example 33 in Table 4 of Nishizawa shows 5.7 wt% of MgO. The amount of 5.7 wt% of MgO is inside the range of 4 wt% to 8 wt% of MgO claimed in Claim 61. However, example 33 shows an amount of 7.4 wt% of SrO. The amount of 7.4 wt% of SrO is outside the range of from 2.6 wt% to less than 4 wt% of SrO claimed in Claim 61.

Examples 34 and 35 in Table 4 of Nishizawa respectively show 3.6 wt% and 1.8 wt% of MgO. The amounts of 3.6 wt% and 1.8 wt% of MgO are outside the range of 4 wt% to 8 wt% of MgO claimed in Claim 61.

Example 36 in Table 4 of Nishizawa shows 5.5 wt% of MgO. The amount of 5.5 wt% of MgO is inside the range of 4 wt% to 8 wt% of MgO claimed in Claim 61. However, example 36 shows an amount of 4.8 wt% of SrO. The amount of 4.8 wt% of SrO is outside the range of from 2.6 wt% to less than 4 wt% of SrO claimed in Claim 61.

Examples 37 and 38 in Table 4 of Nishizawa et al. respectively show 2.8 wt% and 0.9 wt% of MgO. The amounts of 2.8 wt% and 0.9 wt% of MgO are outside the range of 4 wt% to 8 wt% of MgO claimed in Claim 61.

Examples 39 to 46 in Table 5 of Nishizawa variously show of

from 0 wt% to 2.8 wt% of MgO. Amounts of from 0 wt% to 2.8 wt% of MgO are outside the range of 4 wt% to 8 wt% of MgO claimed in Claim 61.

In reference to examples 30 and 31 of Nishizawa, these two examples show values for SiO_2, B_2O_3, Al_2O_3, MgO, CaO, SrO, and BaO that fall within the ranges claimed in Claim 61. However, as stated above Nishizawa does not disclose a ZnO content and it is submitted that applicants' Claim 61 is distinct over Nishizawa based on the claimed amount of from 0.5 wt% to 2 wt% of ZnO in Claim 61.

In summary, even though Nishizawa shows ranges in the Abstract, none of the 44 examples out of 46 examples of Nishizawa fall within the ranges of Claim 61. It is obvious that the compilation of examples in Nishizawa is far removed from Applicants' invention. Therefore, Nishizawa does not teach or suggest the specific ranges of compositions of the claimed glasses.

It is submitted, further, that the brief reference to ZnO, which ZnO in conjunction with four other potential glass components is not to exceed 5 **mol** percent, is not a teaching of Applicants' invention as claimed in Claim 61. That is, Applicants Claim 61 states that zinc oxide is to be present in an amount less than **2% by weight**. It is therefore respectfully submitted that Claim 61 distinguishes over and is not made obvious by Nishizawa it being noted that Nishizawa does not teach or suggest the use of zinc oxide in any of the 46 examples. It is submitted that this brief reference to ZnO, which ZnO in conjunction with four other potential glass components is not to exceed 5 **mol** percent, is not a teaching of Applicants' invention as claimed in Claim 61.

It is again submitted that the glass art is an unpredictable art. Thus, any change in the composition of a glass could not predict the

outcome of that glass and thus the outcome would be unpredictable. Further, what may appear to be a predictable outcome regarding glass compositions is not predictable and any appearance of predictability in this case is based on the use of hindsight, which is improper in determining obviousness.

It is submitted that Applicants' Claim 61 claims a **selection invention** of a selection of specific ranges for the specific components of the claimed glass. The specific characteristics of the present invention result only by selecting the very specific ranges of the specific components of Claim 61. Since there is nothing in Nishizawa that would point to the specific ranges of the specific components of the present invention, it is submitted that Applicants' selection invention is not obvious over Nishizawa.

10. Discussion of Claim 64 in View of Nishizawa:

Specifically, the Examiner stated:

> "Claims 44-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishizawa et al., U.S. Patent 6,169,047.
>
> Nishizawa et al. teach an alkali-free glass consisting of 58.4-66 wt% SiO_2, 5-12 wt% B_2O_3, 15.3-22 Al_2O_3, 0-8 wt% MgO, 0-9 wt% CaO, 3-12.5 wt% SrO, and 0-<2 wt% BaO. See abstract of Nishizawa et al. Nishizawa et al. teach that glass can be used as a substrate for various displays and photomasks. See column 1, lines 15-118. Nishizawa et al. teach that PbO, As_2O_3, and Sb_2O_3 are not incorporated except for unavoidable amounts. See column 4, lines 35-39. The reference teaches that the glasses have a strain point of at least 640°C, coefficient of thermal expansion from 27 to $40 \times 10^{-7}/°C$, and a density less than 2.60 g/cc. See column 4, lines 53-60. The reference teaches that the glass is manufactured by the float process. See column 5, lines 23-27.
>
> Nishizawa et al. differ from the instant claims by not teaching specific examples that lie within the compositional ranges nor ranges of glass components which are sufficiently specific to anticipate the claim limitations. However, the compositional ranges of Nishizawa et al. overlap the compositional ranges of claims 44-56. Overlapping ranges have

been held to establish prima facie obviousness. See MPEP 2144.05.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected from the overlapping portion of the ranges of Nishizawa et al. because overlapping ranges have been held to establish prima facie obviousness.

One of ordinary skill in the art would expect that glasses with overlapping compositional ranges would have overlapping ranges of properties as recited in claims 44-48,55, and 56."

10a. Nishizawa Disclosure:

With reference to the Abstract, Nishizawa discloses:

"an alkali-free glass consisting essentially of

58.4-66 wt% SiO_2,
5-12 wt% B_2O_3,
15.3-22 Al_2O_3,
0-8 wt% MgO,
0-9 wt% CaO,
3-12.5 wt% SrO, and
0-<2 wt% BaO."

Nishizawa, as understood, shows a glass for use as a substrate glass for various displays. Nishizawa shows eleven tables, Tables 1 to 11, with a total of 46 examples of glass compositions. The glass components are expressed in terms of parts by weight on the oxide basis.

10b. Applicants' Invention as claimed in Claim 64:

In contrast, Applicants' Claim 64 states:

"A glass comprising:
a substantially alkali-free aluminoborosilicate glass;
said glass having a coefficient of thermal expansion $\alpha_{20/300}$ of between 2.8×10^{-6}/K and 3.8×10^{-6}/K;
said glass having the composition (in % by weight, based on oxide):

SiO_2	> 58 - 65
B_2O_3	> 6 - 11.5
Al_2O_3	> 14 - 25
MgO	4 - 8

CaO	0 - 8
SrO	2.6 - < 4
BaO	0 - < 0.5
with SrO + BaO	> 3
ZnO	0 - 2."

It is submitted that Applicants' Claim 64 claims a **selection invention** of a selection of specific ranges for the specific components of the claimed glass and the discussion of Claim 61 herein above applies in corresponding manner to Claim 64. The specific characteristics of the present invention result only by selecting the very specific ranges of the specific components. Since there is nothing in Nishizawa that would point to the specific ranges of the specific components of the present invention, it is further submitted that Applicants' selection invention is not obvious over Nishizawa.

It is further submitted that Nishizawa provides only a **1 in 970** probability of the same ranges being selected for the claimed glasses in view of Nishizawa, see Table 8, following page.

It is clear from the foregoing that Nishizawa does not make obvious Applicants' Claim 64 and thus Applicants' Claim 64 should be allowed.

Table 8 - Comparison Of Glass Of Nishizawa And Glass Of Applicants' Claim 64

Component or Sum of Components	Nishizawa's Ranges of Components	Overlap between Applicants' Ranges of Components and Nishizawa's Ranges of Components	Ratio of Applicants' Ranges of Components to Nishizawa's Ranges of Components	Running Probability
SiO_2	7.6%	6.6%	0.87	1 in 1.14
B_2O_3	7%	5.5%	0.78	1 in 1.47
Al_2O_3	6.7%	6.7%	1.0	1 in 1.47
MgO	8%	4%	0.5	1 in 2.9
CaO	9%	8%	0.89	1 in 3.3
SrO	9.5%	1%	0.105	1 in 32
BaO	2%	0.5%	0.25	1 in 126
SrO + BaO	11.5%	1.5%	0.13	1 in 970

10c. Discussion of Dep ndent Claims 65-80 Dep ndent Upon Claim 64:

It is submitted that the dependent Claims 65-80 are allowable based on their dependence upon Claim 64, having regard to the presentation made for Claim 64. Since the combination of the limitations of Claim 64 is not shown or disclosed in Nishizawa, it is submitted that Claims 65-80, dependent upon Claim 64, are not made obvious, and Claims 65-80 should be allowed.

11. Art Made of Record:

The prior art made of record and not applied has been carefully reviewed, and it is submitted that it does not, either taken singly or in any reasonable combination with the other prior art of record, defeat the patentability of the present invention or render the present invention obvious. Further, Applicants are in agreement with the Examiner that the prior art made of record and not applied does not appear to be material to the patentability of the claims currently pending in this application.

In view of the above, it is respectfully submitted that this application is in condition for allowance, and early action towards that end is respectfully requested.

12. Leave to Delay Treatment of Formal Objections Until Allowable Subject Matter is Indicated:

In accordance with 37 C.F.R. §1.111, it is hereby respectfully requested that any objections or requirements not fully treated and set forth in the outstanding Office action that relate to form and are not necessary to further consideration of the now pending claims, be held in abeyance until allowable subject matter is indicated.

Summary and Conclusion:

It is submitted that Applicants have provided a new and unique

FLAT PANEL LIQUID-CRYSTAL DISPLAY SUCH AS FOR A LAPTOP COMPUTER. It is submitted that the claims are fully distinguishable from the prior art. Therefore, it is requested that a Notice of Allowance be issued at an early date.

If mailed, I, the person signing this certification below, hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450, on the date indicated in the certification of mailing on the transmittal letter sent herewith, or if facsimile transmitted, I, the person signing this certification below, hereby certify that this paper is being facsimile transmitted to the United States Patent and Trademark Office on the date indicated in the certification of facsimile transmission on the transmittal letter which is being facsimile transmitted herewith.

Respectfully submitted,

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